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Important contributions to geographic science are constantly being made through expeditions financed by funds set aside from the Society's income. For example, immediately after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. So important was the completion of this work considered that four expeditions have followed and the extraordinary scientific data resultant given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures, evidently formed by nature as a huge safety-valve for erupting Katmai. By proclamation of the President of the United States, this area has been created a National Monument. The Society organized and supported a large party, which made a three-year study of Alaskan glacial fields, the most remarkable in existence. At an expense of over $50,000 it has sent a notable series of expeditions into Peru to investigate the traces of the Inca race. The discoveries of these expeditions form a large share of the world's knowledge of a civilization which was waning when Pizarro first set foot in Peru. Trained geologists were sent to Mt. Pelee, La Soufriere, and Messina following the eruptions and earthquakes. The Society also had the honor of subscribing a substantial sum to the historic expedition of Admiral Peary, who discovered the North Pole April 6, 1909. Not long ago the Society granted $20,000 to the Federal Government when the congressional appropriation for the purchase was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people and incorporated into a National Park.

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CHICAGO TODAY AND TOMORROW

A City Whose Industries Have Changed the Food Status of the World and Transformed the Economic Situation of a Billion People

By William Joseph Showalter

Author of "New York—The Metropolis of Mankind," etc.

WHEN La Salle, the intrepid French explorer, standing on the shore of Lake Michigan, surveyed, with the prophetic eye of the geographer, the site of what is now Chicago, the fourth city of the world, he is reputed to have exclaimed: "This will be the gate of empire, this the seat of commerce."

So definitely do the forces of geography give direction to the currents of history that this explorer, surrounded by what must have been an unprepossessing site, a vast region as yet peopled only by Indians and bison and wolves, was able to look forward through the years and to see arising a teeming metropolis, the center of an empire whose richness beggars description, whose influence upon civilization challenges estimate, and whose future promises achievements that no careful writer would attempt to detail, lest today he seem an enthusiast and tomorrow a short-sighted prophet.

YOUNGEST OF THE WORLD'S CITIES OF MILLIONS

Other cities there are that outrank Chicago in size—London, New York, and Paris are larger—but there is not today on the face of the globe a single metropolis with as many as a million inhabitants that is as young as Chicago, with her two and a half millions.

The Portuguese court was living in Rio de Janeiro before Chicago was more than a lakeside village of fifteen ramshackle houses. Buenos Aires was the seat of a bishopric before La Salle first saw the shores of Lake Michigan. Tokyo and Osaka, Canton and Peking, Calcutta and Bombay, Moscow and Petrograd, Vienna and Budapest, Berlin and Hamburg—all these were fair-sized cities when the site of Chicago was still an unpeopled marsh.

Geography made Chicago. Its position at the foot of the Great Lakes resulted in its evolution as the farthest inland terminus of navigation of the inland seas. All railroad lines of the early history of the northern part of the great Mississippi Valley converged on this one point as unerringly and as necessarily as caravans seek passes in crossing mountain barriers.

Made what it is by the processes of geography, Chicago soon returned the compliment by helping geography transform other regions. Its slaughtering and

Photograph by C. R. Faulkner

LA SALLE STATUE IN LINCOLN PARK: CHICAGO

La Salle was one of Colonial America's men of vision. Yet Chicago has outrun even his broad comprehension, and the day will come when a Lakes-to-the-Gulf waterway will be an accomplished fact. Then will Chicago ship its cargoes to all the world by water, if it does not even rival the cities of the Clyde and the Mersey as a shipbuilding center.

packing industry has changed the center of gravity of the meat-producing world, giving American-grown meat to Briton, Frenchman, Belgian, Swede, Norwegian, Spaniard, Greek—to any one who has something to give America in exchange.

Its agricultural-implement industry has revised the economic status of more than half of the inhabitants of the earth—the hum of its sowing machinery figuring in seed-time operations for a billion people, and the click of its harvesting machinery resounding on every continent, if not indeed in every country within the confines of civilization.

Its sleeping-car industry has entirely revised the geography of travel, bringing hundreds of places separated by mountain and plain close to each other—even to the extent of enabling half of the people of America to be within shut-eye-town distance of the great Middle West metropolis.

RIVAL WONDERS OF THE PAST AND FUTURE

Situated in the very heart of the world's most fertile and prosperous valley, at the natural cross-roads between the industrial East and the agricultural West, the ore-producing North and the cotton-growing South; possessing the cheapest water transportation on earth and the finest railway facilities in the world, it was inevitable that Chicago should grow; and it is equally inevitable that it will continue to grow.

Indeed, one hesitates as to which were the better story, the wonder-tale of the ninety-five years that have sufficed to convert the village of sixty inhabitants into the metropolis of two and a half millions, or the bold plans of far-seeing city-builders who are doing the initial work toward making Chicago a fit place of abode for the five million inhabitants it expects to have before the dawn of the middle decade of the twentieth century.

It is interesting to pause for a bird's-eye inventory of what the city is today. Fourth in population, it ranks first among the world's great urban centers in many ways. No other place butchers as much meat, makes as much machinery, builds as many cars, manufactures as much furniture, sells as much grain, or handles as much lumber.

A casual investigation shows that it is America's principal piano market, its chief mail-order center, its leading stove market. The city has the busiest street corner in the world, the most traveled bridge in existence, the largest department store on the map, the largest art school on the globe.

It has so many buildings that if placed in a row they would reach from New York to San Francisco; furthermore, the city normally grows at the rate of ten thousand houses a year, leading even New York in the vastness of its construction program.

AN EMPIRE IN ITSELF

One soon finds that Chicago is a little empire in itself. Thirteen American States have fewer churches; thirty-seven have smaller populations; many States have fewer miles of roads than the Windy City has of streets. It has more telephones than Montana has people. There are nations whose postal business is not nearly as great as that handled by the Chicago post-office; countries by the dozen that spend less money for governmental purposes; even continents that move less freight than is carried into, out of, and through this one city.

Having added two million people to its population in thirty-five years—more than live in the entire State of Kansas—it was inevitable that the city should encounter many knotty problems in providing for the well-being of such a host. Time after time it enlarged its boundaries, improved the transportation system, recast sanitary arrangements, and revised fundamental plans in one way or another; but just as often it has had to take further steps as necessary and as radical as those taken before. The city had to raise the whole business district fourteen feet to insure drainage; it had to reverse the flow of a river to secure proper sanitation, and it had to establish an entirely new water system to meet ever-growing needs.

And yet today it is up against harder problems than ever. The men who made Chicago were not as far-sighted as the

Photograph of drawing by Kaufmann & Fabry Co.

OLD FORT DEARBORN, WITH SURROUNDINGS, IN 1856: CHICAGO

one who discovered its site. He looked down through the years and saw in the vista of the future a world-city, while they built only for their day and time. So Chicago, like Topsy, "jes' growed"; and instead of being one great, well-planned, carefully laid out city, for a long time it was only a series of loose-jointed villages, in none of which was any effort made to anticipate the future, and in all of which the people had too many concerns of the moment to give thought to those of years ahead.

A RING OF WATER AND A LOOP OF STEEL

The result was that Chicago grew up hampered and crowded. The Chicago River, as reversed by the drainage canal, elbows its way through the city, flowing west for some nine blocks, and then south and southeast for many more, before finally turning westward again. Thus the river drew a fluid line around two sides of the business district, while the lake confined it on a third side and the railroads dammed it back on the fourth.

As if this were not enough, the elevated railways supplemented the ring of water with a loop of steel, and presently the great metropolis found itself with residential districts as wide as the prairies, but with a business district so cramped and so much a menace to the city's future growth and prosperity that there arose a universal cry for relief from the conditions that threatened the strangulation of its development.

That cry brought its answer in the shape of what is at once one of the most ambitious and yet the most conservative city plan ever worked out. That plan takes cognizance alike of the immediate needs and the future requirements of the city. It is laid out in units suited to the necessities of the hour and the financial abilities of the moment; at the same time it has been so developed that each completed unit is a step toward the ideal urban community, and the sum of them a symmetrical development that will provide for double the present population and, it is hoped, afford proper foundations for the expansions of a century.

BLOCKHOUSE OF FORT DEARBORN
THIS BUILDING OCCUPIES THE SITE OF OLD
FORT DEARBORN, WHICH EXTENDED A LITTLE
ACROSS MICH. AVE. AND SOMEWHAT INTO THE
RIVER AS IT NOW IS.
THE FORT WAS BUILT IN 1803 & 4, FORMING
OUR OUTMOST DEFENSE.
BY ORDER OF GEN. HULL IT WAS EVACUATED AUG.
15, 1812, AFTER ITS STORES AND PROVISIONS
HAD BEEN DISTRIBUTED AMONG THE INDIANS.
VERY SOON AFTER, THE INDIANS ATTACKED AND
MASSACRED ABOUT FIFTY OF THE TROOPS AND
A NUMBER OF CITIZENS, INCLUDING WOMEN AND
CHILDREN AND NEXT DAY BURNED THE FORT.
IN 1816 IT WAS RE-BUILT, BUT AFTER THE BLACK-
HAWK WAR IT WENT INTO GRADUAL DISUSE AND
IN MAY 1837 WAS ABANDONED BY THE ARMY, BUT

Photograph by International Film Service

TABLET ERECTED AT THE SITE OF OLD FORT DEARBORN: CHICAGO

Chicago is the youngest big city in the world. Men are living today who have seen it grow from a motley village of nondescript structures into a magnificent metropolis, with a population surpassing that of any one of thirty-seven of the sovereign States of the American Union.

It were too long a story here to relate the details of the formation of the Chicago Plan, or to give more than a bird's-eye view of its aims; but they show so well what a municipality can do that it forms a most encouraging example for other urban communities.

THE CHICAGO PLAN COMMISSION

The realization that Chicago was growing fast and would outstrip its facilities unless early action were taken came at the time of the World's Fair. The Merchants' Club and the Commercial Club each took up the work of planning for the future, and each soon found itself duplicating the efforts of the other.

They therefore merged as a new organization, raised funds for sending experts abroad, and in two years spent $85,000 in creating a plan and publishing a report. The plan recommended was accepted by the City Council, which authorized the Mayor to appoint a com-

Photograph by Kaufmann & Fabry Co.

A VIEW OF THE MIDDLE SECTION OF MICHIGAN AVENUE, CHICAGO'S "FINEST STREET IN THE WORLD"

With many of the city's best hotels and shops fronting on it, with a park fringing it and a yacht basin beyond, Michigan Avenue is certainly a beautiful and inspiring thoroughfare. Note the Art Institute in the right background.

A PANORAMA OF CHICAGO'S BUSINESS DISTRICT

One of Chicago's ills is its vast teaming traffic. At present more than 150,000 tons of freight a day must be horse-drawn or motor-moved, most of it in the narrow confines of the business district, which, with its surrounding lofts and warehouses and freight yards, is only a mile wide and two miles long. New York's teaming traffic is only half as large, in spite of the fact that Gotham has no freight subways.

Photograph by International Film Service

A SATURDAY-NIGHT CROWD IN ONE OF CHICAGO'S NEIGHBORHOOD DANCE HALLS

The people of the Lakeside Metropolis are intent on business by day, but when the daytime cares are past they give themselves over to social relaxation to the fullest extent. The spirit of the breezy West is found in pleasure-emporiums as well as in market-places.

mittee to determine what units should be executed first.

This committee is known as the Chicago Plan Commission. It is non-partisan, non-political, having advisory but not executive powers. It has a membership of 325, representing every section of the city, every interest, and every shade of public opinion. The municipal, county, State, and Federal officers whose work has any relation to the several projects provided for in the plan are *ex-officio* members.

In order to provide for a continuing executive head, Charles H. Wacker was made permanent chairman; and though city administrations come and city administrations go, the Chicago Plan is never lost sight of; indeed, it finds each new administration realizing more than the preceding one that it is a people's pet project.

How firmly rooted in the mind of the average citizen it has become is disclosed by the referendum held in the November election with reference to the improvement of Michigan Avenue. That improvement was authorized several years ago by a popular vote, which approved a bond issue of three million dollars for carrying the project into effect.

But the war came on, and with it such a tremendous increase in prices that the work could not be done unless the bond issue authorized was more than double the amount originally asked for. Yet the people, having already burdened their pocketbooks by putting four Liberty Loans, a Red Cross drive, and an allied war-work drive "over the top," responded with an overwhelming majority in favor of the new bonds.

A REMARKABLE CENSUS OF TRAFFIC

How hard it is to carry improvements through is well illustrated in the case of this undertaking, the details of which will be discussed later. Under Chicago law it is necessary to prove that an improvement is of local rather than of general benefit, in order to tax the property-owners of a given assessment zone for that improvement.

To do so in the Michigan Avenue instance a study had to be made of all the traffic entering and going out of the Loop District. A great staff of census-takers was set to work keeping a record of the comings and goings of every vehicle passing in or out. By checking up the numbers it was shown at what hour the vehicle came in, what route it took, where and when it stopped, and where it went out again.

How thoroughly the census was worked out is illustrated by the experience of a Chicago motorist. A friend, happening to be recording the passing vehicles at Rush Street bridge one evening, saw the motorist and his wife pass in their car. He set down the number, as the work required. Later he saw the wife going back alone, and still later saw the man and another woman go out of the district in a taxi.

When the watcher reached headquarters he checked up the motorist's movements, just to see whether one car could be followed from the time it went into the district until it came out.

A few days later the traffic census-taker accosted his motoring friend: "I've got a line on you now!" he exclaimed. "Last Wednesday evening you crossed the Rush Street bridge at 7:40 o'clock. Your wife was with you and you went to the Auditorium for dinner. After dinner you sent your wife home in your car, and at 9:39 you took a taxi at the Sherman House in company with another woman. You drove down Randolph Street to Michigan Avenue, stopped at the Blackstone for thirty minutes, and then drove up Michigan Avenue and across the Rush Street bridge."

The motorist admitted that the census-taker had correctly stated his journeyings of that evening, but wanted to know what he meant by such "sleuthing." The taxi trip was a perfectly proper one, but it did serve to show how careful was the census.

But even the taking of such a census, which resulted in the accumulation of tons of figures, was only the beginning of the difficulties. Eight thousand lawsuits had to be litigated before the work could be done; then the people themselves had to pass judgment on the improvement by voting for or against the bond issue.

LAKE SHORE DRIVE, CHICAGO'S FASHIONABLE RESIDENCE DISTRICT

Along this highway are gathered the town houses of many men and women who have made Chicago and its civilization-serving industries.

A PASTORAL PICTURE FROM WASHINGTON PARK

Chicago's park system is one where beauty waits on utility. They are all connected by a boulevard system some fifty miles long, giving the motorist a parkway entirely around the heart of the city.

THE CITY'S CHIEF ASSET ALSO ITS GREATEST HANDICAP

When a survey of the city preliminary to the creation of the Chicago Plan was made, it at once became obvious that the railroads were the municipality's greatest handicap as well as its greatest asset. In times gone by they had been allowed to get control of almost any land in the city they desired; and the competition between them was such that each played for the best position. When the game ended, it left the metropolis little more than a series of oases of residence and trade in a desert of railroad terminals and freight yards.

The central business section, broadly bounded by the Chicago River on the north and west, the lake on the east, and Twelfth Street on the south, is hemmed in on all sides by terminals and yards, which even thrust themselves inside this area and leave only about a quarter of a square mile of territory absolutely free.

The immense amount of trackage in the heart of the city simply made the original street system a scrap of paper. North and south, streets became lost here and there in the great maze of railroad trackage. Wabash Avenue is a through street for less than a third of the length of the city; Dearborn disappears for several solid blocks; La Salle is closed for six blocks at one point and for shorter distances at other places; similar conditions prevail with reference to the three remaining streets east of the south branch of the river, while conditions as serious obtain beyond that stream.

With east and west streets a similar situation prevails. From Twelfth Street northward, Eleventh, Ninth, Seventh, and Congress streets have been unable to break the steel barrier, while Quincy gets lost at the river.

HOW THE RAILROADS ARE HELPING

So the first problem was to plan for the creation of new railway terminal and yard layouts, permitting the east and west and north and south streets to pursue their orderly way. At first the railroads were against the proposals, but latterly they have fallen in with them.

The railroads west of the Chicago River agreed to a reconstruction of their terminals. The Northwestern has already finished its monumental depot, and the roads entering the Union Station, led by the Pennsylvania, have laid out a terminal system and prepared plans for one of the finest railroad structures of the kind in the world. These plans involve the construction of streets and viaducts for the benefit of the city valued at six million dollars, and the payment of a million and a half dollars additional into the municipal treasury.

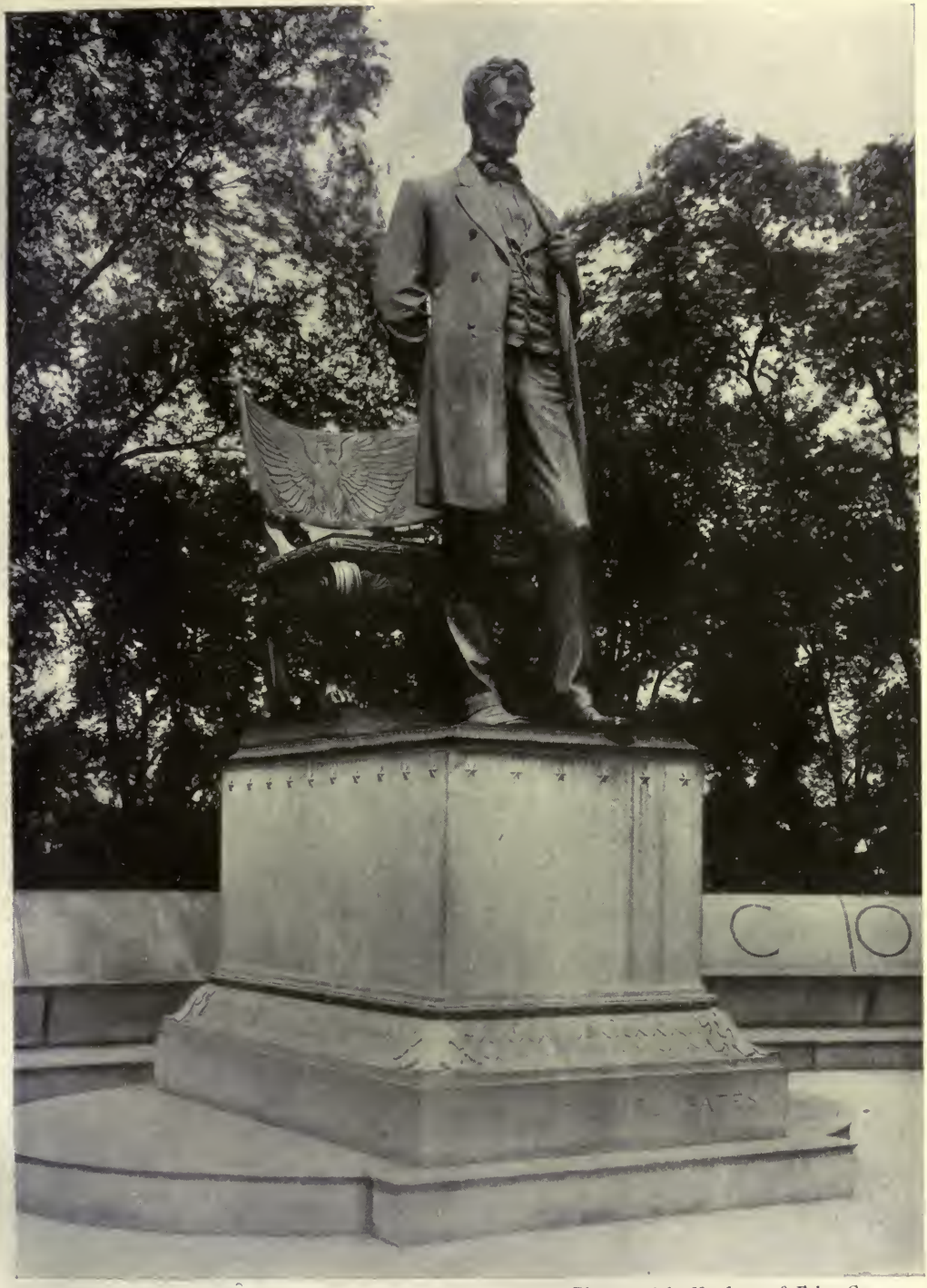
Likewise, the Illinois Central is preparing to build a magnificent new station of monumental type, south of Twelfth Street, and large enough to take care of all the railroads now entering the city from the east and south that are not included in the Union Station group. This great terminal will be two miles long and from six hundred to seven hundred feet wide. It will provide twenty main tracks and accommodate trains on three levels in the station itself. One of these levels will take care of the electrified suburban service.

CHICAGO RIVER TO BE STRAIGHTENED

Coincident with the vast improvements that are destined to grow out of a revision of the city's railroad layout will come a straightening of the south branch of the Chicago River. It is proposed to cut out a big bend in the channel, thus redeeming 194,000 square feet of ground, worth enough, at prevailing real-estate values, to pay for the improvement. Such an improvement would permit the extension of four principal north and south streets through the railroad district.

In order to relieve the unsightly situation of a freight transfer yard at Chicago's front door, the Illinois Central has agreed to establish a great freight terminal at Markham. This will leave only a local freight station on the water front and will largely eliminate one of the city's worst eyesores.

The general idea of the Chicago Plan is not only to develop the Lake Front as the front yard of a great metropolis, and to secure new traffic channels leading into and out of this business district, but also



Photograph by Kaufmann & Fabry Co.

THE ST. GAUDENS LINCOLN, IN LINCOLN PARK: CHICAGO

Lincoln Park, on the North Side; Jackson and Washington, on the South Side; Douglas and Humboldt, on the West Side; and Grant, on the business district water front, are Chicago's principal parks. The Chicago Plan proposes to unite the three big lakeside parks by a magnificent series of drives and lagoons.

Photograph from Chicago Architectural Photo Company

ONE OF CHICAGO'S MICHIGAN AVENUE BUSINESS BUILDINGS

Built firm and on broad foundations, Chicago's big office structures have about them that air of solidity that characterizes the whole city.

Photograph by International Film Service

A CITY WITH A REAL FRONT YARD

Grant Park, with its temple-like colonnade, its Art Institute, and its statuary, is a front yard of which any city might be proud. The realized Chicago Plan will make it a veritable dream of civic beauty.

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MICHIGAN AVENUE'S STATELY STRUCTURES AS SEEN FROM THE LAKE

Chicago's business district is all within four blocks of Lake Michigan, and Grant Park, as it is to be, will make this section of the water front one of the most beautiful combinations of lakescape, landscape, and architecture to be found anywhere in the world.

to provide a series of diagonal avenues that will permit every quarter of the city to reach every other quarter without going around two sides of a square. The plan can best be visualized by reference to the map on page 40.

In the execution of the plan the widening of Twelfth Street was first undertaken. This is one of the principal east and west thoroughfares. It was a narrow, cluttered street, but one of the main arteries through which the West Side reached the Lake Front. At an expenditure of about five million dollars, buildings were razed or moved back and a splendid thoroughfare developed.

The Michigan Avenue improvement came next. The beautiful highway, with its connecting arteries, unites the North Shore with the South Side. For years this thoroughfare has been the pride of Chicago and the admiration of all who visit the city. As a part of the Lake Shore drive that links the woods of southern Wisconsin with the plains of northern Indiana, it is a magnificent street, yet it has one impossible section.

THE BUSIEST BRIDGE IN THE WORLD

That section is at the crossing of the Chicago River. The Indians in the olden days called this immediate vicinity by a name that meant "the place of the wild onion," and if it smelled as bad then as it does now, the name was not a misnomer. Yet here converges what is believed to be the densest traffic that crosses any bridge in the world.

A break in the Avenue at Randolph Street makes a jog leading to the Rush Street bridge, which is about as homely a structure as the eye could see, being an old-fashioned, single-span drawbridge. Other streets besides Michigan Avenue lead to it from both sides of the river; and morning, noon, and night it is the neck of a traffic bottle, always blocking vehicular movement both by reason of its smallness and because the draw frequently is open

to permit the passage of vessels into and out of the river.

After the river is crossed, the Avenue does not recover its equanimity for several blocks. It meanders along through Carroll Avenue, then through Pine Street to Lincoln Parkway, which in turn becomes the Lake Shore Drive.

Under the new improvement plan the jog is cut out by the razing of scores of buildings; a new double-decked bridge will be built, and there will be a separation of team and truck traffic from light vehicular traffic, the latter using the upper level and the former the lower.

The need for a double-decked bridge at this point was shown in a recent investigation. London Bridge heretofore was supposed to hold the world's record for density of traffic, with 7,578 vehicles crossing it in twelve hours. But a count at the Rush Street bridge showed that it carried a thousand more vehicles in eleven hours than London Bridge carried in twelve.

The waste of money occasioned by inadequate traffic facilities in the past reaches astonishing proportions. When it is remembered that on the eight crossings of Michigan Avenue between Washington and Indiana streets fifty thousand vehicles were counted in eleven hours, as compared with thirty-five thousand in twelve hours at eight of the busiest crossings in London, the cause of delays will appear.

And when one gets into a taxi that registers the time lost by traffic delays and bridge waits, as well as the distance covered, he receives a very pressing appreciation of what the sum of these delays must mean in dollars and cents. In a single year, in terms of one team or motor car, the delays amount, at these crossings, to the remarkable total of more than a hundred thousand days. Think of a hundred thousand days of waiting with the taximeter running all the time!

The new part of the Avenue will be double-decked from building line to building line. The approaches to the two-level section will be by very gradual slopes, and one will hardly realize that he is passing from the city grade to an upper level. The public entrances to all buildings will be from the upper level, the lower being reserved for freight handling, etc.

The third important project in the series of unit undertakings of the Chicago Plan is that of doing away with the unsightly produce market in South Water Street.

The Federal Government has ordered all bridges spanning this part of the Chicago River to be raised, and as Water Street is parallel thereto, it would become nothing more than a series of ramps unless treated in some unusual way. So it is proposed to acquire all property between Water Street and the river, and to utilize it for making a very wide thoroughfare on the bank of the river, with two levels, in keeping with the new levels on Michigan Avenue. This improvement will keep at least fifteen thousand vehicle trips a day out of the sadly overworked Loop District.

CHICAGO, THE INLAND "SEASIDE RESORT" OF THE FUTURE

To be a manufacturing and commercial metropolis and at the same time an inland Atlantic City is a privilege vouchsafed very few cities in the world. Yet Chicago is destined to have a water front that might make many a seaside resort envious.

To secure the full benefits of her situation, the city is undertaking to connect her three great lakeside parks. Already Lincoln Park has edged a narrow way southward along the beach until there is a wonderful curving stretch of green reaching to Grand Avenue and making a four-mile parkway unbroken and unmarred.

From Grand Avenue southward this stretch of green will be pushed onward, crossing to an island outside the inner harbor, and thence back to the mainland and Grant Park. From this park to Jackson it is proposed to reclaim nearly thirteen hundred acres from the lake, on a stretch of about five and a half miles.

The reclaimed area will consist of an outer park of 850 acres and an inner one of 432 acres, separated by a lagoon 600 feet wide. Based on the lowest prices paid for land in the same section by the

Photograph by C. R. Faulkner

A PARK SCENE: CHICAGO

No city in America has parks more pleasing to the eye or more restful to the body of man than those of Chicago. They were made to use and not merely to admire. There isn't a keep-off-the-grass sign in any of them, and some of them are veritable bowers of flowers in the summer-time.

Illinois Central Railroad, the value of the ground thus reclaimed will be forty-six million dollars.

But it will cost the city nothing! All that Chicago will have to do is to construct the necessary retaining walls, with the consent of the Federal Government, and then collect $3,000,000—more than enough to reimburse the city for these walls—from the people who need a dumping ground.

When this ground has been reclaimed, and Grant Park connected with Lincoln Park, there will be a lakeside playground some fourteen miles long. The people of every section of the city will be brought within a you - don't - have - to - transfer street-car trip to the Lake Front playground; and Chicago, indeed, will be its own Atlantic City. One need only ride along the Lake Shore Drive and Sheridan Road to see how beautiful such reclaimed ground can be made.

CHICAGO'S MAIL POUCH

Another element in the transformation of the Chicago of yesterday into the Chicago of tomorrow is the question of an adequate post-office. A vast proportion of the nation's mail between the East and the West passes through Chicago, making it of national as well as of local concern that adequate facilities be provided.

Heretofore the federal authorities have never been able to look far enough ahead, with the result that before a new post-office was completed the city had already outgrown it. In the early eighties a building was erected on the site of the present post-office, and had to be torn down ten years later because of its inadequacy. Then the present structure was erected, and for ten years, while it was building, the city had to get along with a makeshift. The present structure is not yet two decades old, but everybody realizes its utter inadequacy.

So Chicago induced the railroads planning to build a new Union Station to move their site two blocks further south than they had intended, leaving two magnificent squares between that station and the Northwestern Station. Nearly two-thirds of the mail handled in and through Chicago passes between the railroads using these two terminals.

The volume of the postal business of the city reaches almost unbelievable proportions. Two billion pieces of mail are handled annually, and the receipts are greater than those of any other post-office in the world. The business done at this one office is eight times as great as that of the entire postal system of Norway and four times as great as that of the Kingdom of Holland. The parcel-post business exceeds that of any other five cities in the United States.

The site and building of the present post-office cost the government one million dollars. Such has been the enhancement of realty values that it is estimated to be worth twelve million dollars today—the enhancement of value alone being sufficient to take care of the construction of the proposed new two-block post-office. Since the present building was completed the postal business of the city has quintupled.

Having seen the results of a pinch-penny policy in the past, Chicago is now asking the government to put up an adequate post-office outside of the Loop District.

THE AMAZING LOOP DISTRICT

That district, not more than a quarter of a square mile in area, has only nineteen streets in it, with street-cars on all but four of them. It is entered daily by twenty-odd thousand street-cars and more than 130,000 vehicles. A million and a half people traverse its streets every day, and a quarter of a million work there. To get the post-office outside of this jammed district is agreed by all to be one of the prime requirements of the Chicago Plan.

Undertaking improvements that in the end will cost some two hundred million dollars, improvements that will make the city one of greater wealth and better health, improvements that will make it compare with any other city on earth in the development of the esthetic side of the life of the community, improvements that will serve as an inspiration and as a model for urban development for all communities, the people of Chicago ask the nation to help them only by giving them an adequate post-office, for which they pay many times over, and to recog-

Photograph by International Film Service

CLARENDON AVENUE BATHING BEACH: CHICAGO

No city in the world has finer bathing facilities for its people than Chicago. It gets mighty hot sometimes, but one is within ten minutes or so of a bathing beach, and the breezes always blow there. "A lake front for the people's health and happiness" is Chicago's slogan.

nize their rights to water for sanitary purposes and to the water front for a playground.

NO "KEEP OFF THE GRASS" IN CHICAGO

The city annually spends five million dollars for park purposes; more per capita, perhaps, than any other city of the first order in existence. There is not a "keep off the grass" in the entire park system; and all recreational facilities are free except the boats in the lagoons.

At the two golf courses in Jackson Park a third of a million balls were teed off in 1916. Twice as many people play on the long course in Jackson Park as play on the long course at the historic links at St. Andrew. No charge is made for playing, and there are locker accommodations for three thousand, while some sixty an hour can be started in play. Frequently players have remained up all night in order to get a chance to tee off next day.

There is a "swimming hole" within walking distance of every boy in Chicago; and even with the fine municipal bathing beaches of the lake front not far away, these mid-city park lagoons are always in use, providing joy for the hearts of the kiddies who visit them.

SHIFTING WATERS FROM FUNDY TO MEXICO

Long ago Chicago discovered that if it were not to develop into a hotbed of typhoid fever and other diseases of the intestinal tract it would have to devise some way of keeping the water of the lake front free from pollution. A mounting typhoid rate, making the city more nearly a pest-hole than a proper habitation for man, demonstrated that it could not continue to mix sewage with drinking water by draining the sewers into the lake.

So, heroic measures were taken to end the pollution. The Chicago River was forced to give up an age-long right to contribute its water to the St. Lawrence, and was made to flow across the divide separating the Great Lakes from the Mississippi River. Thus waters that normally ran into the Bay of Fundy were dispatched into the Gulf of Mexico and made to carry the burden of Chicago's sewage as they went.

This was accomplished by the construction of a drainage canal 36 miles long, from the south branch of the Chicago River to the Illinois River at Joliet. This waterway, 24 feet deep, and 64 feet wide in rock and 202 in earth, has a fall of 40 feet. It serves the triple purpose of drainage, navigation, and power development. Its construction was begun in the World's Fair year and cost nearly seventy million dollars. It was built larger than the requirements of the hour for drainage, and sooner or later will form a part of the waterway that will permit river steamers to ply between the Lakes and the Gulf.

When the State legislation authorizing the canal was passed, a provision was incorporated providing that, in order to prevent the sewage from becoming a nuisance and a menace to the country through which the canal passes, there should be a flow of 333⅓ cubic feet per second for every hundred thousand people. Realizing that the population would probably reach three million by 1930, the city provided for a flow of 10,000 feet per second, with an ultimate capacity of 14,000 feet.

But the Secretary of War, under his control of navigable waters, stepped in and fixed the flow at 5,000. Later, when it was proposed by the city to construct a branch to drain the Calumet Lake district, the question of the effect on the water level of the Great Lakes was brought in.

On the ground that a greater flow would cut down the lake level, the Secretary of War kept down the allotment; so Chicago was between the devil of State law and the deep sea of Federal order.

Although pointing out that Lake Michigan was higher in the ten years following the opening of the canal than in the ten preceding; and although showing that it was higher by fifteen inches in January, 1917, than it was in January, 1916; and, further, that it was higher in 1916 than it had been in any January since 1876, the Sanitary District authorities were unable to convince the Secretary of War.

Photograph by Kaufmann & Fabry Co.

THE UNION STOCKYARDS, THE NATION'S CHIEF RESERVOIR OF UNSLAUGHTERED MEAT

Measured in the value of the product, the slaughtering and meat-packing industry is the greatest in America. Bread, iron, and steel take back seats in the presence of the country's meat. And the heart of the trade is in the Packingtown district of Chicago. More animals have gone to the butcher's block here than in any other spot in the world.

A friendly suit, which is still pending, was brought in the Federal courts to determine the relative powers of the State, the city, and the Federal Government in the premises. Upon its outcome hinges the question of whether or not Chicago can send enough Lake Michigan water down the Mississippi River to protect the lake from pollution.

Through the Sanitary District, which now comprises a territory of 858 square miles, covering the region from the town of Wilmette to the Indiana line, the city is both a real-estate operator and the owner of a power plant. Nine great aluminum wires carry 42,000 horsepower cityward from the hydro-electric plant above Joliet. They supply one county, twelve municipalities, and many private concerns, besides furnishing the city itself with power for pumping water out of the lake into the city mains and the canal, and for lighting the fourteen thousand arc lights used in the municipal system.

"SIC SEMPER TYPHOID!"

The result of the opening of the drainage canal was phenomenal. Typhoid, which had reached a degree of prevalence that was truly alarming, began to subside immediately, and Chicago, but lately the most unhealthful principal city in America, soon was cutting down its death rate faster than any similar community anywhere. No man who knows the history of the conquest of water-borne disease by the building of this canal can fail to appreciate the triumph of the sanitarians. They said they would cut the typhoid rate in half, but they actually sliced off more than 90 per cent of it!

Like all great world cities, Chicago has many problems still unsolved. Most serious of these is the urban transportation situation. With more passengers to carry than all of the steam railroads of the United States together, and with the great bulk of the cars that carry them entering the narrow confines of the constricted business district, it was inevitable that a heroic revampment of conditions would be needed.

Some very striking steps of coöperation between the various companies operating the urban transportation lines have been taken in the past. These companies were urged to believe that universal transfers would redound to their respective advantage. Very dubious on the subject, yet imbued with the general spirit of coöperation for the city's welfare, they agreed to try it, merging all of the surface lines, for purposes of operation, into one system and all of the elevated lines into another.

TRANSPORTATION AND WATER PROBLEMS

The result was greater profits than ever before, and the experiment did much to remedy the situation. But much water of development passes under the bridge of progress in Chicago with the lapse of a few years, and now the city is where nothing but a radical extension of both elevated and surface lines, with subways added, and universal transfers established between elevated, surface, and subway lines, will suffice.

A plan was prepared by a commission representing the city, and accepted by the transportation interests, providing for the requisite extensions, and for the operation of all the lines under a board of trustees appointed by the people, with a definite guarantee to all stockholders of a fair income. Every commercial and progressive organization in the city was behind the plan, but somehow it failed of a majority in the November referendum. It is quite plain, however, that Chicago must soon face the transportation problem that handling an overwhelming population involves.

The water situation also presents something of a problem. In a recent number of the GEOGRAPHIC (see "New York—The Metropolis of Mankind," July, 1918) it was shown that Gotham's great aqueduct system carries enough water to slake the thirst of the whole world. Chicago, with half as many people, uses more water than New York. The reason for this, of course, is that Chicago is the home of heavy manufactures and New York of light, the former demanding much more water than the latter. The per capita use in Chicago is two and a half times that in New York.

The combined water and sewer mains

Photograph by Kaufmann & Fabry Co.

A RIVER THAT WAS FORCED TO FACE ABOUT

When Chicago grew populous, its death rate kept pace with its physical expansion until the city decided to send the waters of Chicago River into the Gulf of Mexico instead of permitting them to continue flowing into the Gulf of St. Lawrence. Since then Chicago has been showing the world what sanitation can accomplish (see text, page 21).

of the city are longer than the combined length of the Ohio, Mississippi, and Missouri rivers. The annual volume of water flowing through them would fill a cistern a thousand feet in diameter and a mile deeper than the deepest trench in the ocean.

THE CITY GOVERNMENT'S ANNUAL PAYROLL $39,000,000

Another problem that vexes the great lakeside metropolis is that of its government. There are 22 local governments in the city, having no central control and no central responsibility. There is much duplication, considerable lack of cooperation, and not a little antagonism. The result is that Chicago spends annually $39,000,000 for salaries alone. Between the county and the city there are five separate, independently organized courts, with concurrent jurisdiction in many particulars, and yet with their respective powers so limited that frequently cases arise where no one of them has sufficient jurisdiction to adjudicate all questions involved. There are six separate clerk's offices where half the number might suffice.

The cost of the endless round of elections that result from this scattered authority is almost unprecedented. The outlay for a recent year for Chicago and Cook County was approximately $2,000,000. The cost of a city election is about $700,000, and of a judicial plebiscite about $200,000. And Chicago likes elections, if one may judge by the number she has.

With such matters as these pressing, Chicago voted overwhelmingly in favor of a State constitutional convention, and

Photograph by International Film Service

THE GENERAL GRANT MONUMENT, ILLUMINATED, IN LINCOLN PARK: CHICAGO

No city on the map of America was more patriotically devoted to the aims and end of America's participation in the world war than Chicago. In Liberty Loan subscriptions, in Red Cross work, in War Fund drives—everywhere the city went over the top at home with the same enthusiasm that sent her sons after the Huns abroad. Already plans are in the making fittingly to commemorate in bronze and marble her heroes' achievements on the battlefield.

will go there resolved to secure a simplification of her governmental machinery and a concentration of responsibility.

But the story of the great metropolis of the Middle West is only half told with the recital of its problems and its plans. One might turn to many aspects of the city's activities and find rich fields of interest. A chapter could be written on the two conventions a day that is Chicago's average and the ten thousand delegates a week the city entertains. Another might be written on the babel of voices one hears upon its streets, for there are more than thirty distinct nationalities abiding within its confines. Only two Irish cities have more Irish, only one Bohemian city more Bohemians, and only

one city in Norway, one in Sweden, and one in Poland has more Norwegians, Swedes, and Poles, respectively.

Still another chapter might be devoted to the railroads, for Chicago is preëminently the world's railroad capital. Here centers nearly half the railroad mileage of the nation. The trackage within its limits would reach from New York to San Francisco. Some fifteen hundred trains arrive and depart every day; yet not a single one passes through. More sleeping cars roll into the city every morning than into any other city in the world. Fourteen States in the American Union have less main-line mileage than Chicago has trackage.

MACHINERY THAT IS FEEDING THE WORLD

Chicago's manufactures especially claim attention because, as pointed out in the beginning, they have served to revamp the economic and travel geography of the world. So remarkable has been the growth of these industries that they have made a thousand millionaires the while they have enriched the whole world.

First in the order of their founding and in its service to humanity is the harvesting-machine industry. When Cyrus McCormick invented his reaper, back in the quiet little valley of the Shenandoah, little did he dream that in less than fourscore years the whole grain-producing world would resound with the click of its sickles, and less did he foresee the tremendous growth in the world's population that certainly would have brought starvation but for the reaper. And when Deering boldly staked the earnings of a lifetime on the Appleby binder and on Manila twine, he did not foresee how great a service to humanity he was rendering.

Yet today a single agricultural machinery plant covers 229 acres, has a floor space of 4,000,000 square feet, employs 9,000 men and women, makes 200 tons of twine a day, and turns out a farm machine every thirty seconds. Within 10 minutes' motor ride, another big plant employs 7,000 people and does a business only a shade smaller. A binder every two minutes and a mower every time the clock ticks off 60 seconds is the record of the latter plant when it concentrates on these two types of machines.

When the reaper was invented there was still left the problem of binding the grain, gathering the sheaves and shocking them. Then came the twine binder and the elimination of hand binding. But gathering the sheaves was a piece of very hard work for the small boys on the farm. Before them was the binder, kicking out the sheaves as fast as four spirited horses could walk, and behind them the shockers, always with a "hurry up, boys," as counsel. When the bundle carrier came, the kiddies of the farm sang pæans of praise to its inventor.

But still there was the problem of shocking. It takes two hard-working men to shock behind an ordinary binder with an ordinary field of wheat. For years the harvester companies saw these men working and took it as a challenge to their labor-saving genius. At last Chicago is able to offer the world a mechanical shocker. The new machine shocks wheat like a veteran, setting up the sheaves and putting on the caps as if it were human.

It is a sight to see the different types of implements made by the Chicago farm-machinery factories. One might think that a mower is a mower before going there, but it will soon be found that there are mowers and mowers. Here is one geared to cow power, another for water-buffalo; there one made for horses, and over yonder one to be pulled by a tractor. One is made for extremely low cutting and another for very high. One has a very long cutter-bar, for smooth ground and a sturdy team, and another a very short one, for rough ground and a light team. Also there are binders that merely cut and bind the grain and others that cut, thresh, and bag it. Some of the machines must cut stalks as heavy as a lead pencil, while others must take care of stalks that trail on the ground like shoestrings.

THE TWINE THAT BINDS THE WORLD'S SHEAVES

Not less interesting than the harvester industry is its complement, the manufac-

© International Film Service

CITY HALL AND COUNTY BUILDING: CHICAGO

Chicago has twenty-six governments and near-governments within her borders, each with its own independent functions. Elections alone cost as much here as all activities cost in many fair-sized cities. A State constitutional convention has been called, one of the purposes of which is to consolidate the governing bodies in the city into one organization.

ture of twine. More than 150,000 tons of this product are required to bind the world's grain, and without it every grain binder in existence would lose half its usefulness. The bulk of this twine is made from sisal fiber, which comes from Mexico. The plant from which it is obtained is known as the henequen and is closely related to the century plant. The remainder is made of the manila fiber, which comes from the Philippines, or from a mixture of the two fibers.

The process of transforming fiber into twine begins with the opening up of the great bales as they come from Yucatan. After inspection and mixing, the fiber is put through a series of machines which comb it out into long ribbon-like slivers, becoming smaller and thinner and softer with each operation. Once sufficiently

Photograph by International Film Service

AN AVIATOR'S-EYE VIEW OF THE LOWER END OF CHICAGO'S BUSINESS DISTRICT

This picture shows a section of Grant Park and a sector of the Illinois Central Railroad Yards in the right foreground. Under the Chicago Plan, the Illinois Central has patriotically agreed to eliminate, as far as possible, all trackage on the water front and to convert the rest into a subway (see text, page 12).

combed and softened, the slivers are carried to the spinning room. Here they enter a machine which has a bobbin so placed that as it revolves it twists the sliver and converts it into twine.

When the bobbins are full they are removed and sent to the balling machine. This machine takes the twine from the bobbin and by a peculiar winding operation makes the balls of twine one sees in the harvest field.

In the whole twine factory, with a capacity of 200 tons a day, there is no dust to be seen, for suction ventilators draw it away and keep the plant, which otherwise would be dustier than an old-fashioned grist-mill, as clean as a pin.

As the twine is spun and balled, it is initialed by the operatives to show who had charge of the several machines employed in its making. Random balls selected by inspectors are unwound on reels, so that every strand may be examined for defects and tested for tensile strength.

For when a ball of twine goes to the harvest field it must be good or a twine manufacturer's reputation is ruined. If, after all these precautions, a ball that is bad should get into the market, the system of records kept at the mill will enable the manufacturer to trace the defective product back to its beginning and tell the bale from which the fiber came, who inspected it, who spun the ball, who wound it, and all.

It has often been asked why twine manufacturers do not use other fibers instead of going to far-off Yucatan or farther-away Manila. For answer one must go to the cricket and the grasshopper. Those little creatures can tell why they eat every other sort of fiber known except manila and sisal. One manufacturer spent more than a million dollars trying to make a flax twine that did not taste good to grasshoppers and crickets. But he found their appetites versatile, and that with them only sisal and manila are taboo.

Would you measure the size of the world's grain crop? Then, remembering that there are still vast areas in the backward regions of the earth that have not yet heard the merry music of the binder, you should pause to reflect that the annual harvest in the lands where binders do operate requires 150,000 tons of twine, and that each pound of this makes 700 feet. A little problem in arithmetic shows that the whole amounts to forty million miles. Think how small an item twine is in the making of our daily bread, and yet the annual use of it calls for enough to make sixteen hundred strands reaching around the earth.

THE DEATH MARCH OF THE ANIMAL ARMY

Chicago's hold on the slaughtering and packing of meat is only less striking than its supremacy in the harvester and twine industries. One-fourth of all the meat animals that leave the farms and ranches of the United States are bound for the butcher's blocks of the lakeside metropolis.

Would you visualize the vast size of the animal army that annually marches into Chicago to pay the bloody sacrifice that the human appetite requires of it? Then pause and watch it pass by, single file. Here comes the cattle contingent, two and a half million strong; head to tail the line would reach from Chicago through the North Pole to the Russian coast. Then follow the hogs, seven million of them—a solid procession of pork long enough to reach from the southern shores of Lake Michigan via Mexico City and Panama to the mouth of the Amazon River. Even the sheep brigade is not a mean one, for the bell wether of the flock would be coming up to the Chicago Drainage Canal when the last one in the line was leaving the Panama Canal.

The stockyards of the city have a capacity of 75,000 cattle, 300,000 hogs, and 125,000 sheep. More than 60,000 people find employment in Packingtown, and a million dollars change hands on the average day in the barter and trade of the stockyard.

The story of the conversion of the live animal into meat and the hundred and one by-products is too well known for repetition here. No need the pros and cons of costs and profits in the meat industry be considered. But certain it is that when Gustavus Swift and Philip D.

Photograph by International Film Service

INSPECTING A SECTION OF CHICAGO'S FREIGHT TUNNELS

Chicago up to date has taken the opposite view of her transportation problems from that held in New York. New York puts her merchandise on the surface and her rapid transit below ground. Chicago puts her freight below ground as far as possible and keeps her people on the surface as much as possible. Freight subways connect all the principal business houses with the freight stations. But even then Chicago's teaming traffic is very heavy and a heroic revision of her street system has been demanded. The city has some sixty miles of freight tunnels and some three thousand cars.

Armour went west and set up their packing plants at Chicago they revolutionized the meat industry of a nation and affected that of the world.

A steer weighs only a little more than half as much dressed as on the hoof, and a refrigerator car can carry more than twice as much as a stock car. The saving in transportation charges that has resulted from the substitution of the refrigerator car, with its load of dressed beef, for the stock car, with its load of live cattle, amounts to an enormous total.

Then comes the economy of the salvage of the waste product. The neighborhood slaughter-house annually wasted millions of dollars worth of offal that cannot be utilized profitably in small plants. The Chicago packers pioneered in the utilization of these wastes, and they have made vast fortunes by saving what formerly was thrown away.

A TRAVELING HOTEL WITH 26,000,000 GUESTS ANNUALLY

It is no great distance that separates Packingtown from Pullman either on the map or in the relation of the one to the other. Packingtown would be a strictly local affair without the refrigerator car, and Pullman would have no place on the map but for the sleeping car.

Imagine a hotel with 260,000 beds, 2,960 office desks, and a total registration of 26,000,000 guests a year. And imagine it having 8,000 negro porters carrying a stock of linen valued at $2,000,000 and using some $60,000 worth

Photograph by International Film Service

AN ELEVATOR FIRE IN CHICAGO

Some of the biggest grain elevators in the world are located in Chicago, and when fire breaks out among them the souls of the firemen are put to the test. But Chicago has a fire-fighting system worthy of the city's size, and never again can a Mrs. O'Leary's cow work such destruction as in 1871.

of soap annually. Such is the Pullman Company, as typified by the cars in the service.

But back in Chicago these cars are made. When one rides in them and thinks that this is wrong or that the other thing might be improved, it is with little realization of what steps have been taken to secure the perfect car. On a track near the main entrance to the shops there is a modern sleeper. In this every practicable suggestion from every source is incorporated, in preparation for the monthly meeting of the committee on standards. This committee examines them one by one. Those that to their practiced eyes are obviously unsuited are at once eliminated. The others are passed on for the verdict of the traveling public, which renders a judgment in due time.

The Pullman shops remind one somewhat of a shipbuilding plant. Here are mighty girders, eighty-one feet long and

Photograph by Kaufmann & Fabry Co.

A VIEW OF SOUTH WATER STREET IN THE EARLY MORNING: CHICAGO

South Water Street is perhaps the busiest and at the same time the most antiquated public produce market in the world. The foodstuffs of the entire city pass through this market. Nearly three million cases of eggs, twenty million pounds of butter, seven million boxes of oranges, seven million bushels of potatoes, and one million barrels of apples change hands annually. The place has been called the city's vermiform appendix and is slated for elimination in the execution of the Chicago Plan.

weighing nine tons each. Each of these will form the keel of some new Pullman. To it nine sills are riveted, with floor beams, etc., making a complete underform weighing seventeen tons. On this the superstructure is built, and then the roof deck is swung into position by a crane.

One of the major items in the construction of an all-steel Pullman is the insulation of the car. This insulation consists of a combination of cement, hair, and asbestos, packed into every cubic inch of space between the inner and outer walls of the car and between the upper and lower coverings of the floor. One man with a wheelbarrow could trundle at a single load all of the wood that

enters into one of these seventy-ton hostelries on wheels.

Once the Pullman car was built of wood. The best cabinet-makers in the world were employed, and the ends of the earth were visited in search of fine woods for the interior work. But when the steel car came into vogue the song of the bandsaw was stilled, the planer's plaintive hum was heard no more, and instead there arose, as the poet of the plant has written, "the metallic clamor of steam hammer and turret lathe, and the endless staccato reverberation of an army of riveters."

AN INSPIRING TALE OF BUSINESS

Selling goods to six million customers a year, handling a hundred thousand orders a day in ordinary times, and in rush times nearly twice as many, nothing but the most phenomenal system would stand the strain that the mail-order business of the world's greatest mail-order house involves. The story of how the vast flood of orders flows in and the deluge of merchandise flows out is an inspiring tale of business.

The main plant covers fifty acres and has more than ninety acres of floor space. From the mechanical letter-opener that can dispose of 27,000 pieces of mail an hour to the shipping room, where the merchandise finally starts on its way toward the customer, nothing but organization raised to the nth power could cope with the vast volume of business that sweeps through the great institution.

Here is an order from Farmer Smith, of Jonesville, Kentucky. It contains nine items. The letter-openers send his check to the cashier and the order and letter to the auditor. The latter receives them as one of a batch of twenty-five such orders. One of a hundred clerks reads the order and decides how the shipment shall go—whether by parcel post, by express, or by freight.

From the auditor's office the orders go to the entry department. Here five hundred girls, operating billing machines, make out orders for each department. Farmer Smith's order affects seven departments, so seven tickets are made out. Next the orders pass to the scribing department, which makes out all shipping labels, box markers, bills of lading, etc.

The next step takes it through the great card-index room. Here a record is made and kept of what Farmer Smith has ordered, what money he has sent in, and all information about him that would bear on future transactions. Through a series of endless-belt conveyors the orders are distributed to the girls at hundreds of filing cases—each order to the appropriate case—where the record entries are made and where the routes of shipment are determined—if by freight, by what road; if by express, by what company; if by parcel post, in what zone.

Then the order goes to the distribution department, where the schedule of its transit through the shipping department is made up. Somewhere down in one of the buildings is a great room, marked off into many sections. In each of these sections there are many baskets, and one of these is set aside for the reception of the goods ordered by Farmer Jones. Now, of course, where from 1,200 to 2,600 orders every ten minutes are going through, no basket can wait long for all the items in an order or there would be confusion worse confounded.

EACH ORDER FILLED IN TEN MINUTES

So every order is filled on a ten-minute schedule. The distribution office writes on each ticket of the order the ten-minute period within which all the merchandise must be in the particular basket assigned to Farmer Smith. Gravity and endless-belt conveyors carry the various items to the designated place, one by one, and from all parts of the merchandise building. After the order is assembled—and you may bet your last dollar that it will not be more than ten minutes from the time the first item arrives to the time the last one puts in its appearance—the basket is sent off by gravity chute to the packers.

Meanwhile the tickets that were made off early in the routine have gone back to the billing room to be consolidated into one order, which, in turn, goes back to the packer who checks up the merchandise and sends the bill out with the shipment. Mechanical conveyors then carry

Photograph by International Film Service, Inc.

A LINE WAITING TO PLAY GOLF IN JACKSON PARK: CHICAGO

Chicago plays as earnestly as it works, and the public golf links in Jackson Park are reputed to be the busiest in the world. More balls are teed off there than at the historic links of St. Andrew. Many a golfer has sat up all night, so as to be sure to get into the game on the morrow.

the packed orders to loading platforms—parcel-post shipments to one platform, express to another, etc. Here they are again separated, each railroad and each express company having a special section where the packages intended for them are assembled. In the case of parcel-post packages, belt conveyors carry them to an assorting room, where they are properly bagged and labeled, so that the postal service can handle them in bag lots until they reach the point nearest their destination where mail-bag lots are broken up.

In the rush season this institution handles as many as 20,000 orders an hour. The number of employees is greatly augmented at these times, and the cream of each enlargement is added to the permanent list, with the result that the force is always kept efficient.

The annual turnover of an institution like this is almost past belief. Even in peace times, before the costs of production had been lifted to unparalleled heights by the competition of Mars, the ledger of one mail-order house at the end of the year is said to have shown total sales reaching to nearly $200,000,000.

A DEPARTMENT STORE WITH 46 ACRES OF FLOOR SPACE

There may be one or two other department stores in the world outside of Chicago that have outgrown a full city block, but certainly no other such store has outgrown as large a block nor occupied more floor area than Chicago's leading establishment. The square bounded by Wabash, Washington, State, and Randolph streets is a big one—how big may be gathered from the statement that the basement sales-room of this institution covers four acres of ground, while the

Photograph by International Film Service

THE COLISEUM DURING A REPUBLICAN NATIONAL CONVENTION: CHICAGO

Chicago has nominated a majority of the Presidents of the United States since the first nomination of Abraham Lincoln. The city succeeds in capturing a majority of the Republican conventions and gets a fair share of the Democratic gatherings.

main aisle on the main floor of the establishment is nearly 400 feet long.

And yet the structure covering that block, 13 stories high, with four basements below, is unable to accommodate that vast retail business built up by the merchant prince of the Middle West; so across Washington Street there is a second building, big enough in itself for a princely business, housing a man's department store.

Imagine a retail business that requires 46 acres of floor space, yet of such high class that more than 60 running miles of carpet are laid down to maintain the quiet elegance of the establishment. Fancy an army of shoppers so numerous that 77 passenger elevators are sadly overworked when high-water mark is reached, and a volume of purchases that requires 16 big freight lifts to handle it.

Picture a store that even in slack times has 10,000 employees and in rush seasons has to add 3,000 extra sales and delivery

Photograph by Kaufmann & Fabry Co.

"COME ON IN, THE WATER IS FINE": SWIMMING POOL IN PALMER PARK, CHICAGO

Chicago thoroughly believes in the application of the principles of the old swimming hole to urban conditions. In every quarter of the city there is a park pool with bath-house facilities, within easy walking distance of every one. And when the hot spells come Young America in Chicago knows where it is cool.

people. Consider the size of an institution that can meet the wants of a quarter of a million people in a single selling day in the big season.

Then you will begin to get some idea of the vastness of this wonderful temple of trade. It is a business of such proportions that it carries some 62,000 open accounts per month and 100,000 per year. Its stock of goods on hand is worth enough to ransom a king and diversified enough to supply every essential need of a man or woman from the cradle to the grave.

A trip from the flagstaff to the tunnel basement of this department store is an experience one can never forget. A stock-taking at the end of the journey would reveal that the visitor had been on his feet seven hours, had visited 150 sales departments, had surveyed wares valued in eight figures, and had outhiked an army on the march.

FURS OF FABULOUS PRICE IN COLD STORAGE

Several upper floors are not used by the selling departments, but are utilized for divers and sundry purposes that we ordinarily do not associate with merchandising. Immense cold-storage vaults containing furs valued at $4,000,000 are on the one hand and vast refrigertors containing provender sufficient to feed a whole army division are on the other. Here is a shoe shop that makes the village cobbler appear ten centuries out of date, and there a department that can mend the rarest rug or restore the plainest carpet that a cosmopolitan trade may send in.

Here is a whole floor given up to restaurants, tea rooms, grills, etc. Four thousand people may find table room and tempting bills of fare at a time. There isn't a taste or a fancy, from those of the bluff business man of the Middle West to those of the staid society leader and the whimsical debutante, that is not studied and provided for.

As one marches down through the mazes of buzzing activity there are many sidelights that show the bigness of the institution and its atmosphere in striking ways. For instance, the store, aiming at once to display its wares and to help its customers, has installed 27 full-sized residence rooms, which are furnished in approved designs from time to time. Here is one furnished as a living-room, there one as a guest-room; here another as a nursery, and there still another as a den. Yet so large is this store that these 27 rooms become all but lost, and scarcely figure in any bird's-eye survey of the establishment.

MAKING FRIENDS FOR THE FUTURE

When one comes down to the children's floor it is soon evident that the firm is wide awake to its own future. There are scores of rooms equipped with about every sort of plaything that the most imaginative kiddie in all Chicago could conjure up. "Yes, indeed, our little friend," the firm seems to say, "come right in and have a good time. You may break something now and then, but that's all right. We want you to feel that this store is your friend. So jump right in."

And maybe the kiddies don't accept the invitation! They enter into the spirit with such glee that when they have become men and women they could not be pried away with a crowbar from trading there. Does it cost much to maintain such a policy? Go to the toy hospital and look at the staff of people working there; go to the toy morgue and see the daily accumulation of victims ready for the potter's field. Yes, it is very expensive. But untold thousands of those who are today the store's best customers were but yesterday the kiddies who visited the "joyland of toyland in the little-girl-and-boy-land" of that emporium.

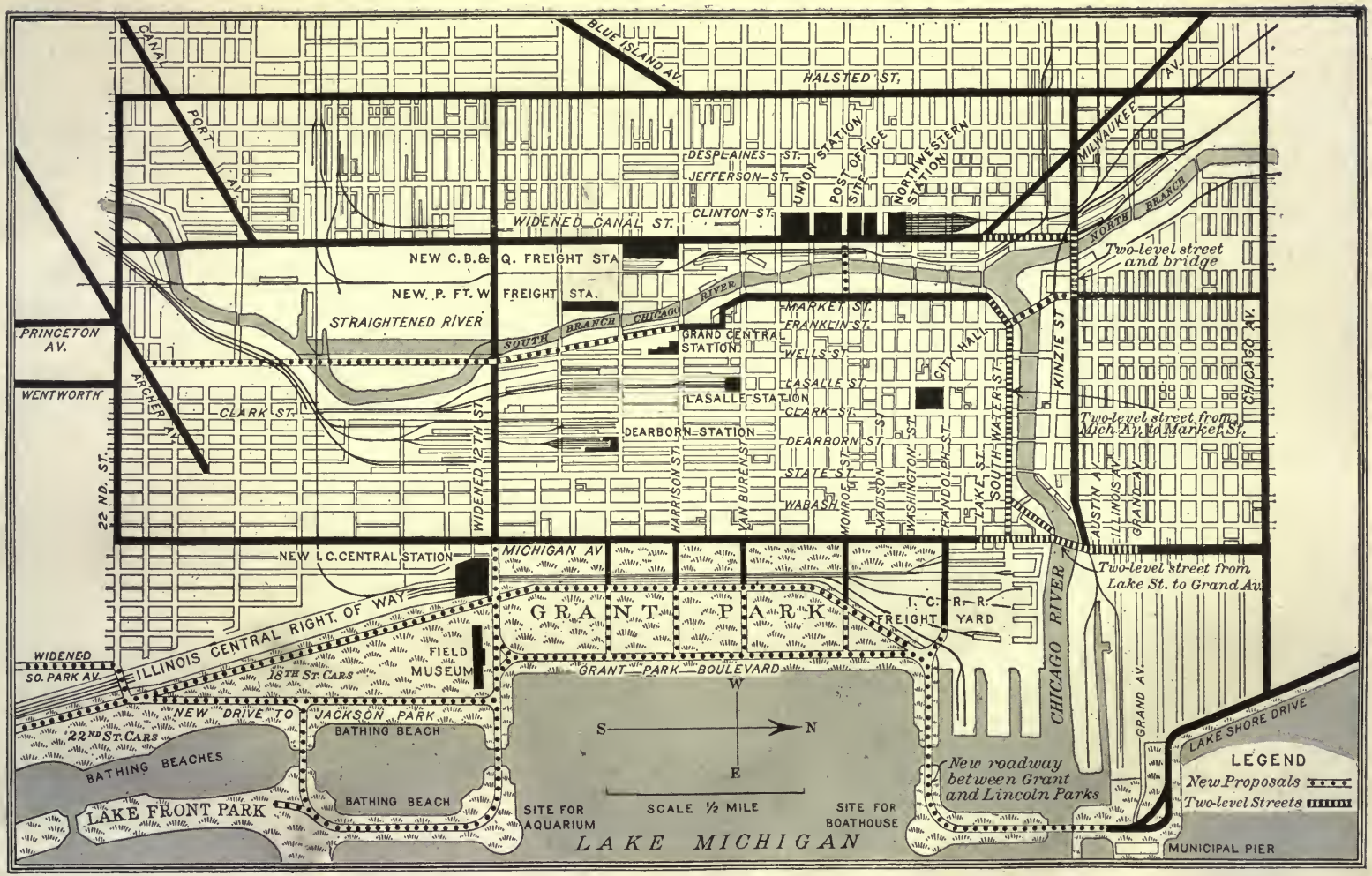
One might write a whole article about such an institution. There is the credit system, where a financial Who's Who that is practically an open sesame for bad debts is maintained. Mr. Black comes in to buy a pair of shoes he wants charged, and Mrs. White purchases some lingerie and says, "Charge it, please." The salesfolk make out the tickets in the usual routine way, and send them through pneumatic tubes to the credit department, which maintains an endless array of slips placed in frames like the room assign-

HANDLING THE MAIL OF ONE OF CHICAGO'S MAIL-ORDER HOUSES

Sending from 1,200 to 2,500 orders through its several departments every 10 minutes of the working day is the task that confronts the management of a Chicago mail-order house, yet every item in a given order must reach a certain basket in a certain section of a certain room within a period of 10 minutes. Only organization developed to the nth power makes such an achievement possible.

A SECTION OF THE FOUR-MILLION-DOLLAR MUNICIPAL RECREATION PIER BUILT OUT INTO LAKE MICHIGAN

This splendid structure is often visited by 75,000 persons a day in summer. Breezes always sweep across it. In a single month a third of a million people danced in its grand pavilion. It has every device and convenience for making the vast crowds that visit it comfortable and happy and for affording them real recreation.



MAP SHOWING THE MAIN FEATURES OF THE CHICAGO PLAN

In addition to the features of the Chicago Plan shown here and discussed in the text, the municipality is acquiring 25,000 acres of land in a broad belt around the city for a park preserve, and preparing to extend Ogden Avenue diagonally through the city from the southwestern section to Lincoln Park, at an outlay of $4,649,000. It is also planning the extension of three other broad thoroughfares north and south throughout the length of the West Side—Western Avenue, Ashland Avenue, and Roby Street. The expenditures to date by the Commercial Club in fostering the Chicago Plan in the press, in the schools, and elsewhere, amount to more than $300,000. The whole plan was prepared under the direction of the late Daniel H. Burnham, who was preëminent among the world's city-planning experts.

MERCHANDISE "SHOOTING THE CHUTES" IN A CHICAGO MAIL-ORDER ESTABLISHMENT (SEE TEXT, PAGE 33)

ment boards of hotels, each slip carrying the rating of a customer.

By the time the packages are wrapped, the sales tickets have gone to the credit department, and Mr. Black and Mrs. White have been submitted to the acid test of the financial Who's Who. If the ticket comes back properly checked the packages are delivered and the two customers depart without realizing that their debt-paying reputation has been thoroughly scanned in the interim. If the tickets bear a different notation, the salesfolk politely tell the customers that they can arrange the charge matter with Mr. So-and-So. Before that no question is asked and no word spoken. The Who's Who heard a silent appeal and rendered an inaudible verdict.

Another feature of this mercantile establishment is its delivery system. Covering nearly 400 square miles of territory and making some 30,000 deliveries a day as an average, it is natural that efficiency should be the keynote of its operation. The handling of the orders as they are collected in the basement of the establishment and then separated according to delivery routes is but little less complicated and yet equally as efficient as the methods at the mail-order house mentioned previously.

A few years ago this store had both horse-drawn and motor vehicles in its delivery service. The question of the relative cost of the two kinds of transportation frequently arose, and it was finally decided to put it to the test of expert accounting. The costs for a long period were kept, and when the balance-sheet was made up it was found that the horse had lost out by such a decisive showing that the whole service was motorized.

In times gone by Chicago has been regarded in the East as a place inhabited by the rough-and-ready type of American more concerned with the amassing of piles of money than with the development of the finer phases of life. When it is remembered that fourscore years ago the city had little more than a name, and was without a railroad or a canal; that it could not boast of a sewer nor of a paved street; that there were but few sidewalks; that mudholes deeper than usual were marked by signs reading, "No bottom here—the shortest road to China!"—when these things are remembered, and then with them is contrasted the splendid city, with its world-serving industries, its great business institutions, its wonderful city-betterment plans, its beautiful art institute, its famous musical organizations, its internationally famous universities, one must feel thankful that there was a rough-and-ready day in the city's history during which the foundations of culture could be laid deep and lasting.

With an educational system following the same lines as the New York system, with a financial district that is as solid and as substantial as the rock of Gibraltar, with a health department that has probably made the most thorough study of the tuberculosis situation ever undertaken by any major municipality, Chicago occupies no secondary rôle among the big cities of the world.

CHICAGO'S SOLICITUDE FOR THE DEAF

No city in the country has done as much in the fitting of its deaf children for normal lives as Chicago. The foremost authorities have long since realized that the only way to teach speech to the deaf in any way that will make it valuable to them is to have them use it out of the class-rooms as well as in school. The child that learns to make use of signs is prone to resort to them, since speech and lip-reading are difficult at first. Such children are in the selfsame boat with the child that studies French in the class-room and leaves it behind elsewhere. Unless one learns to think in French, it takes an effort to use the language. And no child can think in a foreign tongue who utilizes it no further than the class-room.

Chicago realizes this, and has developed all of her public education of the deaf accordingly. Practically every deaf child is being taught under the more modern system—a system for which the country owes a debt to Dr. Alexander Graham Bell. The city has acknowledged this debt by naming its principal day school for deaf children in his honor.*

Chicago is a city with a past, whose "I will" spirit has overcome many an obstacle to its progress; a city with a present that meets every test that war or peace puts upon it; a city with a future of the richest promise.

The late James J. Hill, whose services as a constructive geographer contributed so much to the development of our national resources and the building of our inland empire, understood well the operation of the fundamental laws of geography, and thereby was able to forecast and capitalize the future. Before he died he declared that within a generation the Pacific coast would be the home of twenty million people, and that Chicago, the cross-roads between the two seaboards, would have five million.

One who studies Chicago cannot escape the feeling that Hill was a modest prophet and that the city's splendid achievements of yesterday and its wonderful accomplishments of today augur the fulfillment of plans for tomorrow which will be a source of pride to every American.

*Under the leadership of the "American Association for the Teaching of Speech to the Deaf" (of Washington, D. C.), three-fourths of the deaf pupils in the schools of the United States are being taught the new method of communication, and Illinois' metropolis leads the procession with a 100 per cent enrollment in schools using that method.

THE LEAGUE OF NATIONS, WHAT IT MEANS AND WHY IT MUST BE*

By William Howard Taft

Ex-President of the United States

THE first attempt, after the beginning of the European war, to formulate and state a general plan for a League of Nations to secure permanent peace after the war was made in Philadelphia on the 17th of June, 1915, in a convention of some three hundred or four hundred prominent men interested in the subject and coming from all parts of the country.

They organized themselves into what was called a League to Enforce Peace. They declared it to be desirable for the United States to join a League of Nations, binding its members:

First, to submit all justiciable questions to a judicial tribunal for hearing and judgment;

Second, to submit all other questions arising between them to a Council of Conciliation for hearing, consideration, and recommendation;

Third, jointly to use forthwith both their economic and military forces against any one of their number making war against another before submitting the issue to either the court or the Council of Conciliation, and,

Fourth, to hold conferences of nations to formulate and codify rules of international law to govern in the decisions of the judicial tribunal.

This program was enlarged and made more ambitious at a meeting of the governing body of the League on November 24, 1918. It then declared that *the initiating nucleus* of the membership of the League should be the nations associated as belligerents in winning the war.

It declared further:

First, that the judgments of the international court on justiciable questions should be enforced;

Second, that the League should determine what action, if any, should be taken in respect to recommendations of the Council of Conciliation in which the parties concerned did not acquiesce;

Third, that provision should be made for an administrative organization of the League to conduct affairs of common interest and for the protection and care of backward regions and international places and other matters jointly administered before and during the war, and that such administrative organization should be so framed as to insure stability and progress, preventing defeat of the forces of healthy growth and changes, and providing a way by which progress could be secured and the needed change effected without recourse to war;

Fourth, that a representative Congress of Nations should formulate and codify rules of international law, inspect the work of the League's administrative bodies, and consider any matter affecting the tranquillity of the world or the progress or the betterment of human relations;

Fifth, that the League should have an executive council to speak with authority in the name of the nations represented and to act in case the peace of the world is endangered.

NATIONS SHOULD BE REPRESENTED IN PROPORTION TO THEIR RESPONSIBILITY

It further declared that the representation of the different nations in the organs of the League should be in proportion to the responsibilities and obligations that they assume, and that rules of international law should not be defeated for lack of unanimity.

It will thus be seen that the American Association has become more ambitious in its aims since its first declarations, because under the first declaration it did not propose to enforce judgments of the court or in any way to deal with the recommendations of compromise. The exercise of force of the League was to be

* An address delivered by William Howard Taft before the National Geographic Society, in Washington, D. C., January 17, 1919.

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A VIEW OF DANZIG, WHICH THE NEW POLISH REPUBLIC DESIRES AS ITS OUTLET TO THE SEA AND TO WORLD COMMERCE

The photograph shows the Langer Markt, which, with the Langgasse (Long Street), constitutes the finest thoroughtfare in this quaintly beautiful city of 140,000 inhabitants. The medieval town hall, with its lofty clock tower, is one of the most interesting buildings in West Prussia.

directed only against a nation beginning war before submission to the Court or the Council.

In England, after the organization of the American League, a British League of Free Nations Association was formed, proposing a Court and a Commission of Conciliation, the use of force to execute the decisions of the Court, and the joint suppression, by all means at their disposal, of any attempt by any State to disturb the peace of the world by acts of war.

It looked to the immediate organization of a League of Great Britain and her then allies, with a view to the ultimate formation of a League of Nations on a wider basis, including States at present neutral or hostile. It excluded the German peoples until they should bring forth works meet for repentance and become a democracy.

It contained a provision for action by the League as trustee and guardian of uncivilized races and undeveloped territories. It proposed as a substitute for national armaments an international force to guarantee order in the world, and proposed a further function for the Council of the League in supervising, limiting, and controlling the military and naval forces and the armament industries of the world.

HOW FRANCE JOINED THE MOVEMENT

Late in 1918 a French Association for the Society of Nations recommended that the Society of Nations should be open to every nation who would agree to respect the right of peoples to determine their own destiny, and to resort only to judicial solutions for the settlement of their disputes;

That the use of force be reserved exclusively to the international society itself as the supreme sanction in case one of the member States should resist its decisions;

That the allies should form their association immediately and should work it out as completely as possible in the direction of sanctions of every kind—moral, judicial, economic, and in the last resort military—as well as in that of promulgating general rules of law.

The French Society further provided that the Society of Nations thus immediately formed should control and conduct the negotiations for the coming peace.

It will thus be seen that the League of Nations, as conceived by its proponents in three of the four great nations that have won this war, has substantially the same structure. It includes a court to decide justiciable questions, a Council of Conciliation to consider other or non-justiciable questions and to recommend a compromise. It calls for the organization of the combined economic and military forces of the world to enforce the judgments of the court, and to deal with a defiance of the recommendations of the mediating council as the executive body of the League shall deem wise.

JUSTICIABLE AND NON-JUSTICIABLE QUESTIONS DEFINED

The distinction between justiciable and non-justiciable questions is generally clear, although it may sometimes give rise to disputes.

A justiciable question is one that a court would take up for decision and adjudge upon principles of law. A non-justiciable issue is one in which the claim asserted and denied is not rested on legal right, but is based on a policy which the claimant seeks to maintain for its own safety and for the general welfare.

Such non-justiciable claims are to be weighed by the Council of Conciliation in the light of considerations, not of positive law or juridical equity, but in the light of conventional rules of decency, courtesy, neighborly feeling, and morality which the common brotherhood of nations and their general welfare require.

Illustrations may be given. The Monroe Doctrine of the United States was a declaration by the United States that its interests and safety required that it should exclude from the Western Hemisphere interference by European or other governments to overturn any independent government in this hemisphere; that it should prevent further colonization by any foreign government in this hemisphere; and this has been amplified to prevent the transfer of territory in this hemisphere to any foreign government.

The object was to avoid disturbance of the peace by the ambitions and intrigues of European nations against the

French Official Photograph

NATIVES WEAVING MATS IN WHAT WAS FORMERLY GERMAN WEST AFRICA, CAMEROON

"Germany has been as murderous in dealing with the backward tribes of her colonial possessions as she was in Belgium and in northern France." Scandals in the maladministration of Cameroon and in the oppression of the natives under German rule came to light in 1906. Three weeks after the outbreak of the world war British troops from Nigeria crossed the German frontier into this colony, and on February 18, 1916, its complete occupation by the British and French, working in coöperation, was announced (see page 57).

Photograph from Pictorial Press

A STAIRCASE LEADING TO THE TOMB OF A NATIVE CHIEF: CAMEROON

At the beginning of the world war Germany's Cameroon possessions embraced an area of 305,000 square miles—more than four and a half times the area of all the New England States. The native population about equaled that of Massachusetts, but less than 2,000 whites lived in the colony. Although the Imperial Government had been in control of the territory for 30 years, less than 200 miles of railway had been constructed in this, one of the richest regions of tropical Africa.

French Official Photograph

NATIVES IN A VILLAGE OF CAMEROON, FORMERLY A WEST AFRICAN COLONY OF THE GERMAN EMPIRE

"Gemany has forfeited her right to the colonies by her mistreatment of them in the past." The Cameroon country came into possession of the Germans in 1884, when several merchants signed a treaty with the chiefs of Duallaland and a few months later "assigned" their interest to the Imperial Government (see page 57).

political and territorial integrity and independence of the governments in this hemisphere.

The policy has promoted the peace of the Western Hemisphere. It has promoted the principle of self-determination here, and it has minimized for the United States danger of conflict with European and other nations. It does not rest, however, on the legal right of the United States. It is based on no principle of international law which the United States could invoke in a court.

So, too, the question of whether the Japanese or the Chinese shall be admitted to the United States or shall be admitted to naturalization in the United States is not a question involving principles of international law.

Every nation by international law is given the absolute right to admit whom it will and to exclude whom it will from its shores or from the privileges of its citizenship. The claim of the Chinese and the Japanese to admission or to citizenship must rest on the issue whether neighborly feeling and good-fellowship and international brotherhood require this country to admit races like the Chinese and the Japanese, with their racial qualities and traditions, to share with the present residents of this country the material benefits of residence here or the political advantages of its citizenship.

In issues over the Monroe Doctrine or Chinese or Japanese exclusion the case must go to the Council of Conciliation. It can have no place in a court. The question how a recommendation of such a council adverse to the Monroe Doctrine or Oriental exclusion would affect either must depend on the provision for dealing with recommendations of the council in the plan of the League.

A CASE LOST AND WON BY THE UNITED STATES

Let me give a concrete case of a judgment of a court, of a recommendation of a commission or Council of Conciliation, and a settlement in accordance with the recommendation.

The United States, by a transfer from Russia, became the owner of the Pribiloff Islands, in the middle of the Bering Sea. Upon those islands was the breeding place of the largest herd of fur-bearing seals in the world. They were a valuable property and a considerable annual income was derived by the United States from the sale of the fur.

Canadian schooners began what was called pelagic sealing. They shot the seals in the open Bering Sea. This indiscriminate hunting killed the females of the herd and was decimating it.

Revenue cutters of the United States, by direction of the government of the United States, seized such sealing vessels, brought them into a port of the United States, where were instituted proceedings to forfeit them.

Great Britain objected on the ground that the United States had no legal jurisdiction to do this. The case was submitted to an arbitration. The treaty contained a provision that the arbitrators, should they reach the conclusion that the United States had no legal right, might recommend a basis of compromise.

The United States asserted its right, on the ground, first, that it had territorial jurisdiction over the open waters of the Bering Sea by transfer from Russia, which had asserted, maintained, and enjoyed such jurisdiction, and, second, that it owned the seals while in the sea in such a way that the Canadian schooners were despoiling its personal property.

The court of arbitration held against the United States on both points, deciding that Russia never had any territorial jurisdiction over the open Bering Sea to transfer to the United States, and that when the seals left the islands and swam out into the open sea they were the property of no one and were subject to capture by any one. The judgment of the court, therefore, was against the United States and awarded damages.

Pursuing, however, the recommendation of the treaty, the court made itself into a council of mediation. It said that while the killing of seals in the open sea was not a violation of the legal rights of the United States, of which the United States could legally complain, it was nevertheless a great injury to the common welfare of the world to destroy this greatest seal herd of the world, first, because the fur was valuable and useful for the garments of men and women, and,

THE GYMNASTIC DANCE OF THE MARAKELY: MADAGASCAR

When Germany launched her attack upon France it was with the confident expectation that the French colonies in Africa, poisoned by Prussian propaganda, would revolt against the motherland. Instead, every French possession gave of its store of wealth, of its reserve supply of food, and of its native troops to assist the French armies in stemming the tide of invasion. The humane colonial policy of France in Madagascar and elsewhere has been in gratifying contrast to Germany's mismanagement of holdings in East and West Africa—mismanagement which fully justifies the Entente Allies in refusing to consider a plea for the restoration of these colonies to the German nation.

Photograph by M. O. Williams

THE CENTRAL FIGURE IN THIS GROUP EXPRESSES THE SPIRIT OF ARMENIA BETTER THAN ANY WRITER HAS DONE IT

She has a day's supply of bread for perhaps ten persons, but she looks into the future, asking: "Salvation or massacre—or worse?" for she is a handsome woman in spite of her rags and no Turk would kill her. A League of Nations could safeguard Armenia against the repetition of such outrages as are reflected in the tragic face of this sufferer.

KURD COOLIES AT AMARA, A TOWN IN IRAK-ARABI ON THE BANKS OF THE TIGRIS

The Entente Allies are to establish many new republics in Europe and in Asia, thereby releasing oppressed peoples from the yoke of Prussian militarism and Turkish barbarism, and at the same time forming a series of buffer States, which will make impossible any further aspirations of Germany for the control of middle Europe and the Near East.

second, because the destruction of the herd would destroy valuable and useful industries in the preparation of the seal pelts for use.

Therefore, they said it was good form and in the interest of the world that the four nations concerned should agree upon a compromise, by which the United States might continue to maintain the herd and sell the seal pelts gathered on the islands, and that pelagic sealing should be stopped, but that the United States, in consideration of the other three nations restricting their citizens from pelagic sealing, should divide with the other three nations some of the profits of the herd.

Accordingly, Great Britain, Russia, Japan, and the United States made such a treaty, which is still in force, and under which the herd has been restored to its former size and value. Here we have an

example of a court passing on questions of legal right and deciding them against the United States. Then we have the court changing itself into a council of mediation and recommending a compromise, prompted by considerations of decency and good form and the public welfare of the world, which the nations appealed to have adopted and embodied in a treaty.

VIRTUALLY TWO LEAGUES PROPOSED

The American, English, and French plans all show a purpose to create a smaller League of the allied nations fighting this war, who are, so to speak, to be charter members of a larger League, which they are to form by inviting other nations into it as they show themselves fitted to exercise the privileges the League will give and to enjoy its protection and to meet their obligations as members. The American plan refers to these allied nations who won the war as the initiating nucleus of the larger League.

Each plan looks to the enforcement of judgments and leaves open to the League the question what shall be done with reference to compromises recommended and not acquiesced in. Each one looks to a congress of nations to declare and codify international law.

One of them provides for the reduction of armament; the others omit it. It does not appear in the American plan. I may say that this was not because the ultimate reduction of armament was not regarded as important, but because it was thought that this feature of a League of Nations might meet serious objection until the League should be shown to be an effective substitute for the insurance which reasonable preparation for self-defense gives against unjust foreign aggression.

The purpose of this war was to defeat the military power of Germany and to destroy any possibility in the future of her instituting a war of conquest against the world. It was to make the world safe for democracy and to allow races and peoples oppressed by the imperial central powers to establish independent, popular governments.

This purpose was shown in the fourteen points of President Wilson, set forth in his message of January 8, 1918. The armistice made those fourteen points a diagram of the purposes of the allies to be embraced in the treaty, subject to two modifications by the Entente Allies, one in reference to the freedom of the seas and the other in reference to indemnities.

If the points of the President's message are carried out, there will be created an independent State of the Ukraine, an independent State of the Baltic provinces of old Russia, an independent State of Finland, an independent State of Poland, including Russian, Austrian, and German Poland, with a strip running through East Prussia connecting Poland with Danzig, the port upon the Baltic Sea. There will also be created a republic of the Czecho-Slovaks, including Moravia, Bohemia, and Slovakia—a State lying between Germany on the north and Austria and Hungary on the south.

In addition, the Jugo-Slavs are to be created into an independent republic. Palestine is to be set up as an autonomous State, and so, too, are Armenia and the Caucasus.

In this wise Germany will be hemmed in to prevent her extending herself into Russia, and her ambitious plan of controlling middle Europe to Bagdad and the Persian Gulf will be made impossible.

THE ALLIES PLEDGED TO LAUNCH MANY NEW REPUBLICS

The allies are thus to launch on the troubled seas of new national life half a dozen or more republics whose peoples have never had any training in self-government.

Our experience with Cuba, in which we gave her self-government and had to take her over again after two years for another period of two years, should teach us how uncertain is the fate of such new republics unless they have a protector who can aid them to stand upon their feet.

Self-government is a boon, but it is, as President Wilson says, character. People need training in it in order to make it useful. We allies are now to give birth to seven or eight children, whose steps we must lead gently in order that they may learn firmly to walk. We

Photograph from C. W. Whitehair

TURKISH CAVALRY ON THE ARID PLAINS NEAR BEERSHEBA: PALESTINE

If such troops, inspired by a sinister military power, should again threaten the peace of the world, it would be the duty of the European members of the League of Nations to thwart their malign purpose. America's activities would be confined to the Western Hemisphere, except in the case of a general riot or conflagration (see text, page 61).

have seven Cubas under our parental care, and we must maintain an organization of the League and an active agency of the League to prevent their self-destruction.

More than this, their very existence creates humiliation and resentment in the peoples of the empires out of which they are carved, and these new peoples naturally cherish hatred against the people of the central countries because of the past outrages to which they were subjected. Between the old and the new we shall find jealousies and ambition and selfishness. Even with their present imperfect existence as governments, some of these peoples are already in war in the Ukraine, in Poland, and in some parts of the Slav country.

We fought this war and are reorganizing these new governments for the purpose of maintaining a democratic peace; but if continual quarrel and war are to succeed this change on the map of middle Europe, the purpose of the war and the treaty will fail.

How can these new States be enabled to maintain their self-government and be saved from fighting with their neighbors? Only through the supervision of a League of the Allies.

A SHOW OF FORCE NECESSARY TO INSURE PEACE

The treaty will be as long as the moral law. It will define access to the sea and will delimit in various ways the powers and the rights of the countries within the sphere of war. Immediately upon the signing of the treaty the question of interpretation and application to facts that could not be anticipated will arise.

Interpretation of a treaty and application of it are ordinarily judicial questions as between nations. Indeed, it is the commonest form of a justiciable issue. The interpretation must be authoritative, and it cannot be given except by a court acting under the authority of the League of Nations making the treaty.

Doubtless other questions will arise as between these newly created countries and the old ones which a court may properly settle. But not only will legal questions thrust themselves forward for solution under the treaty, but there will also be many non-justiciable questions of policy between the new and old States that will clash. Therefore, a Council of Conciliation will be as necessary as a court.

If peace is to be maintained, the judgments of the court must be enforced and the recommendations of the Commission of Conciliation must be given weight. For this reason alone the League will have to make arrangements among the members so that their joint economic pressure can be exerted and, where necessary, war may be declared and a sufficient force furnished by one or more of the allies to compel respect for the League court and its other agencies.

Only by economic pressure and force or a show of force can the quarrels growing out of the jealousies of the new and old nations be suppressed.

Another reason why the League must maintain a potential military force is to suppress Bolshevism, that enemy of human civilization.

We have promised, in the President's message of January 8, to enable Russia to get on her feet and to establish a government of her own framing. The Bolsheviki have Russia now by the throat and are preventing a constituent assembly through which alone a democratic form of government can be established, and through which alone a majority of the people of Russia may give expression to their desires as to the form of their government.

Again, we are to draw the boundary between the Balkan States. That boundary has often been drawn in the recent history of Europe, but has rarely stayed drawn. The bitterness between the Bulgarians and the Slavs and the Rumanians, the Greeks and Italians, has often manifested itself in the past. One of the great difficulties in settling the terms of this peace is in the proper division of territory between these Balkan nations and Italy.

After the treaty is made, boundary questions will be justiciable questions, and they can only be settled authoritatively by the League court.

Moreover, the League will have a new function to perform, indispensable in the carrying out of the treaty. It must exercise local government through agencies

THE VANGUARD OF THE BRITISH FORCES WHICH PUNCTURED THE BERLIN-TO-BAGDAD BUBBLE: THE ENTRY INTO BAGDAD

"We fought this war and are reorganizing these new governments for the purpose of maintaining a democratic peace; but if continual quarrel and war are to succeed this change on the map of middle Europe, the purpose of the war and the treaty will fail" (see text, page 55).

to be selected by it and to be under its general direction. The German colonies must thus be governed, and so, too, must Constantinople and the country in its immediate vicinity.

INTERNATIONAL CONTROL FOR GERMAN COLONIES

It will not be satisfactory to all the allies to turn either the German colonies or Constantinople over to any nation. Germany has forfeited her right to the colonies by her mistreatment of them in the past. She has been as murderous in dealing with the backward tribes as she was in Belgium and in northern France. Were we to turn her colonies over to Great Britain or France, it would soon be charged that the trustee was exploiting the colonies for the benefit of its home people.

The acquisition of these lands by one or another government would give the appearance of selfishness to the aims of the allies in the war.

What is true of the German colonies is also true of Constantinople. It must be internationalized. The Dardanelles, the Sea of Marmora, and the Bosporus must be under the guardianship of a government that represents equally all the allies who won this war. Only so will the government be satisfactory. Only so will the management secure peace.

We must have, to make the treaty effective, a League of Nations with a court, a Commission of Conciliation, joint economic pressure and an agreement to use military force, and an executive agency to administer governments and trusts which should be international in their character. The situation, therefore, requires the institution of a League of Nations such as the American, English, and French plans suggest.

This is the natural way in which institutions are born and developed. Men do not create them by academic discussion and because of a general perception of their usefulness. They are usually forced into political existence by conditions which defy the traditions of the past and overcome by their inevitable character the objections that conservative men oppose.

Fortunately, the safest and most practical way to create a general League of Nations is through a limited League having the Great Powers as its charter members.

It would be exceedingly difficult to call a convention of all nations and therein frame the constitution of the larger league. The vanities and jealousies of the smaller nations, whose life and peace and happiness it is the chief purpose of the general league to protect, would nevertheless be very likely to prevent the possibility of any such general organization.

SMALLER NATIONS MIGHT DEFEAT THE PLAN

The smaller nations would be so insistent on a general and equal representation in the governmental branches of the League as to defeat its organization on any reasonable plan.

During my administration there was an attempt to create a World Court, and the plan halted and failed because it was impossible to agree with the smaller nations to any feasible method of selecting the judges. Each nation insisted that it should have a permanent member of the court, and this would have required a court of absurd and impracticable size, like a town meeting, indeed.

With the allied nations as charter members, and with the protection to the smaller nations that the League would offer, the charter members can lay down in advance the feasible lines upon which a general league must be formed, and then admit the other nations to the privileges of the League on condition of their accepting its then structure.

The branches of the League would naturally be, first, a congress, or quasi-legislative branch; second, the court; third, the Council of Conciliation; fourth, the administrative agency, and, fifth, the executive council.

ALL NATIONS TO BE REPRESENTED IN GENERAL CONGRESS

All nations should be represented in the general congress, but the representation should be determined by the charter members in accordance with the population, political importance, and responsibility of each applicant. The congress would enact and codify, subject to the

LONG HAIR FOR CHILDREN, LONG EARS FOR GOATS, AND LONG MANTLES FOR WOMEN ARE THE FASHION IN THE STREETS OF BAGDAD

"The Allies are to launch on the troubled seas of new national life republics whose peoples have never had any training in self-government. They must be led gently in order that they may learn firmly to walk" (see page 53).

approval of the nations, international law and adopt other general rules of policy for the conduct of the League.

The court should not be representative at all. It should consist of great jurists, learned and able in the law, of high character and much experience. The court should have nothing to do with political policies, should have no representative character or constituencies. Its sole function should be to decide the issues presented on pure questions of law and fact.

The Council of Conciliation, however, may well be representative, because it is a negotiating and mediating body. It should have a few permanent members, and in addition temporary representatives of the countries who are interested in the specific controversy to be mediated.

REPRESENTATIVES OF A NEWLY FREED PEOPLE: MESOPOTAMIA

The veiled girl at the left is a betrothed Jewess. She is accompanied by her mother and the two younger daughters of the family.

The executive council will have the duty of enforcing the judgments of the League where they are defied, and of considering what action should be taken in respect to recommendations of compromise by the Council of Conciliation in which one of the parties does not acquiesce. The executive council should be composed, therefore, of those nations who are willing to assume the responsibility of furnishing armies to the League when necessity arises. These, in the nature of things, will be the Great Powers, or the charter members of the League.

Under such an arrangement a League could be made to work. The fact that the smaller nations are not represented in the executive council would not work to their disadvantage, because they could be confident that the greater nations would not unite against them. The inevitable diversity of interests between the greater nations would be their security.

OBJECTIONS TO A LEAGUE OF NATIONS

What are the objections to a League of Nations developed in this way and thus constituted? The first and chief objection is that the United States ought not to bind itself to make war upon the decree of an executive council in which it has but one vote out of four or five.

What authority and duty does the executive council have in the League? It will be its duty to see that judgments are executed.

Why should we object if called upon to declare war and make our contribution to the police force to maintain peace by enforcing a judgment of an impartial court? Such a judgment is not the result of the vote of other powers than our own. It is merely a decision on principles of international law as between two contending nations.

We have heard a great deal during this campaign of international justice.

LIBERATED AFTER CENTURIES FROM TURKISH MISRULE, THEIR FUTURE IS IN THE HANDS OF THE PEACE DELEGATES NOW IN SESSION IN PARIS

"Only by economic pressure and force or a show of force can the quarrels growing out of the jealousies of the new and old nations be suppressed" (see text, page 55).

Why should we favor international justice and then refuse to furnish the machinery by which that justice can be declared and enforced? What risk do we run? It is said that we ought not to be called upon to enforce a judgment against a Balkan State, so far away.

Doubtless, different zones of executive activity for the different great powers might be established for convenience. Thus, except in the case of a general riot or conflagration, our activity might be limited to the Western Hemisphere, while the European nations would take over central and eastern Europe and Asia.

SAFEGUARDING MEMBER NATIONS FROM THE NECESSITY OF MAKING WAR

With reference to the enforcement of recommendations of compromise, the executive council should consider whether it is a case in which peace would be promoted more by economic or military enforcement than merely by international public opinion.

If, in such a case, it is thought that a majority of the executive council should not control the right to call for military execution of the compromise, such action might be limited to a unanimous decision of the executive council. This would prevent the imposition of the burden of war by the determination of the League members upon any nation without its consent. Or the enforcement of such a compromise, if determined on by a majority of the executive council, might be left to that majority.

AN ANSWER TO SENATOR KNOX

Senator Knox, in his criticism, seemed to anticipate that the United States was to be drawn into the war against its will by a majority vote of a convention of heterogeneous nations.

No such result could follow from the organization of a League as indicated above. The assumption that the votes of Haiti, or San Salvador, or Uruguay could create a majority forcing the United States in a war against its interest and will, under a practical League of Nations, is wholly gratuitous and unfounded. It would be left to the vote of an executive council of the great powers, and even then the United States, under the modifications above suggested, could not be drawn into war against its will.

NO CONSTITUTIONAL PROVISION VIOLATED

The next objection is that the United States cannot through its treaty-making power bind itself to make war in any future contingency. The argument is based on the constitutional requirement that Congress shall declare and make war.

I confess that I cannot see the slightest force in this contention. The treaty-making power can bind the United States to make war. It has done so. The legislative arm, the Congress of the United States, must perform the promise or it cannot be performed.

The promise to pay money is exactly analogous to a promise to make war. The treaty-making power binds the government to pay whatever sum it deems just and proper, as where the treaty-making power bound this government to pay $20,000,000 to Spain for the Philippines. That promise had to be performed by Congress, because under the Constitution Congress is the only power to make the appropriation.

PROMISES ALREADY MADE WHICH ENTAIL OBLIGATION TO MAKE WAR

Congress may repudiate either obligation and dishonor the promise of the nation; but that does not invalidate the promise or render it unconstitutional any more than a man's letting his note go to protest renders the original obligation invalid.

We have already made promises that may entail the obligation on us to make war. We have promised to guarantee the political and territorial integrity of Panama, as we have of Cuba. If any nation were to attempt to overthrow Panama or Cuba, or to take any part of the territory of either, we would be under obligation to make war to resist this aggression.

These obligations were entered into by the treaty-making power, but they are to be performed by Congress and to be performed by Congress in a constitutional way—that is, by declaring and making war.

JEWISH WOMEN ON THE STREETS OF BAGDAD

With the signing of the Armistice of November 11, the world awoke from its troubled nightmare of a Europe and Asia manacled by Germany from Helgoland to Hindustan.

Objectors who rely on the Constitution seem to assume that the League plans contemplate a permanent international police force, constantly under command of a Marshal Foch, who may order the international army to enforce a judgment or a compromise without the preliminaries of declarations of war by the League members. This is wholly gratuitous and no plan justifies it. When force has to be used, war will be begun and carried on jointly, in the usual way.

MAKING THE MONROE DOCTRINE INTERNATIONAL

The third objection is that it will imperil the Monroe Doctrine for us to enter into such a League. The whole purpose of the League is to suppress war and prevent the oppression by war of the smaller nations. The Monroe Doctrine is to prevent the unjust making of war against, and the overthrow of, the independent nations in the Western Hemisphere by European or other foreign powers.

The League of Nations merely extends the principle of the Monroe Doctrine to the entire world. Instead of imperiling it, it would strengthen the Monroe Doctrine, because in case of its violation the obligations of the League would require all the great powers to unite in the maintenance of the Monroe Doctrine.

A violation of the Monroe Doctrine as against the United States would in every class of cases but one be a direct violation of the legal rights of one of the nations of the Western Hemisphere. It would be a case for the League court, brought by the assailed nation against its aggressor. The judgment would be one which the United States would have the function to enforce, acting exactly as it would in enforcing the Monroe Doctrine independently.

AN OBJECTION THAT HAS FRIGHTENED MANY PEOPLE

There is, perhaps, one class of cases which would not be reached in this way, and that is where a nation of the Western Hemisphere would sell out its territory or a part of it to a European or Asiatic government.

If this is a real danger, which may be doubted, we can be sure that the great powers would be quite willing to insert in the treaty that the United States should be given a right to object to such a sale. Indeed, Colonel Roosevelt expressed the view that the League of Nations would be willing to adopt our Monroe Doctrine as part of the principles of the League, and I concur in this view. The statements of Lord Robert Cecil, a spokesman for the British Government on this subject, justify it.

Again, the formidable plea is made that by entering a League of Nations, such as has been suggested, we are parting with the sovereignty of the United States as a nation. This has frightened many people; but the objection is like so many other objections. It is a mere confusion of definition, and when analyzed it ceases to be serious.

What is sovereignty? It is the right of the people associated in government to do what they please as a government. It is the freedom of action of governments. It is the liberty of governments in a community of nations. It is quite analogous to the liberty of the individual.

INTERNATIONAL LAW IS THE RULE LIMITING NATIONAL SOVEREIGNTY

What is the desirable liberty of the individual? We describe it as liberty of the individual regulated by law. What does that mean? It means complete freedom of action of the individual limited by such legal restrictions as will enable every other man in the same community to enjoy equal liberty. That is what one branch of the law is for. It is to regulate the rights and duties of the individuals, the one toward the other. It is the impairment of the sovereignty of one individual for the benefit of all the others, so that all may enjoy equal sovereignty.

So it is of governments, and nations, and peoples. They are members of the family of nations. International law is the rule by which their sovereignty is limited, so that they may live together in peace in the world.

We do not propose to limit the freedom of action of a nation in the League to Enforce Peace by anything more than

AN UPPER CLASS JEWESS OF MESOPOTAMIA

Palestine, the homeland of the Jews, is one of the new States which probably will rise from the disintegrating ruins of the empire of the Ottoman Turks. If it is to endure, its security must be guaranteed by the League of Nations.

Photograph by A. W. Cutler

IT IS THE IDEAL OF THOSE WHO SPONSOR THE LEAGUE OF NATIONS THAT ALL THE WORLD BE MADE AS SAFE FOR FUTURE GENERATIONS AS IT IS TODAY FOR THIS BASHFUL MISS OF SHROPSHIRE, ENGLAND

the rules of international law or those of decency, moral conduct, and good form. What we propose in the League is merely to give a sanction to such rules of international law and decency and moral conduct and good form by providing machinery of international courts of justice and conciliation such as to bring needed pressure to bear on the lawless members of the community of nations, so that they shall keep within the law.

A PROTECTION AGAINST THE FOOTPADS AMONG NATIONS

This is in analogy to our domestic courts of justice and our instrumentalities for conciliation in domestic communities. It is not an impairment of sovereignty. It merely stabilizes the sovereignty of every nation by enabling the great and small nations equally to enjoy the benefits of international law without maintaining armed forces to secure their rights, to prevent murder and robbery, and to drive off the footpads among the nations, as travelers and householders of the sixteenth and seventeenth centuries had to go armed always to protect themselves.

It is to protect the sovereignty of the smaller nations and to relieve the greater nations from the burden of their self-protection that the League of Nations is to be formed.

In the sense in which the word sovereignty is used in this objection, every treaty restricts the sovereignty of a nation. Every time it agrees to do anything, it binds itself and its freedom of action, and in this extreme definition of the word the League of Nations would be a limitation upon the sovereignty of the countries entering into it.

A BUGABOO TO BE DISREGARDED BY SERIOUS MEN

But in the true, broad, and liberal sense, sovereignty is a matter of degree, and where a nation retains complete freedom of action within its borders and only yields by its consent to regulations for the maintenance of the principles of morality and international law to be sanctioned by an association of nations, it does not yield its sovereignty at all. The argument is a mere bugaboo and ought not to attract the support of serious men.

The final objection is that in entering into such a treaty we would be violating the traditions of Washington and Jefferson, sacredly followed down to this war, to avoid entangling alliances in Europe or in Asia.

We have been able to live until the last four years and keep out of European wars, but this war has developed clearly that no general European war could happen again without involving the United States.

This country, with its enormous resources, would be resorted to by all belligerents for food, ammunition, and war supplies, and this participation by the United States in the essential maintenance of the war will always put her in opposition to one country or the other and create a friction that ultimately will drive her into the contest, if it lasts long enough.

THE ATLANTIC OCEAN DOES NOT SEPARATE

The Atlantic Ocean is not a separation from Europe. It is a means of communication and transportation.

In Washington's and Jefferson's day we were a month or six weeks from Europe. Now it is but a week in transportation and but a few minutes in point of communication.

We are the greatest nation in the world: greatest in population of a high average intelligence, greatest in natural resources, and greatest, as we have shown in France, in our potential military power. This power enjoins upon us the obligation to the rest of the world to do our share in keeping the peace.

It is a very narrow view of our international duty which would prevent our keeping the rest of the world out of the danger of war.

We are no longer a small struggling nation of four millions of people, as we were in the early part of the last century, but we are now the world's greatest power, and we should not wish to avoid the responsibility which that entails upon us.

MEDICINE FAKES AND FAKERS OF ALL AGES

Strange Stories of Nostrums and Kingly Quacks in Every Era and Clime

By John A. Foote, M. D.

Author of "The Geography of Medicines"

WHATEVER King Solomon had in mind when he said, "There is nothing new under the sun," to a great many people his reputation as a wise man is based on that one remark. "Nothing is new excepting what has been forgotten" was the historic reply of Marie Antoinette's dressmaker when the queen demanded an absolutely original gown. But this point of view is so unusual as to be considered epigrammatic.

Guy de Chauliac, a famous surgeon who lived 600 years ago, wrote a surgical text-book which is now only a historical curiosity, and at the end of it he expressed the belief that probably no further progress in surgery would ever be made. In fact, each generation has been conceited enough to think that it knows much more than the preceding one; that it is, in fact, more progressive.

CURE-ALLS AS OLD AS CIVILIZATION

Accordingly, we are quite surprised, or even amazed, when, as happens every now and then, some "ologist" emerges from his excavations, or his library, and announces, for example, that the Babylonians had artificial teeth and bridgework, or that the Pompeians, just before the eruption of Vesuvius, were wrestling with the problem of suffragette pickets.

The fact is that we have kept on discovering and forgetting, and then rediscovering, ever since man began to think. Most new things, as a rule, have been received with more or less distrust at first, forgotten, and then rediscovered and acclaimed. However, this generality has one marked exception in cure-alls and patent medicines. Cure-alls we have always had with us—these and the drug fakers and substitutors. The slogan of "something just as good" is older than Babylon and Tyre, older than Crete, perhaps as old as Egypt.

That over-used and abused word, psychology, is called upon nowadays to cover things as antipodal as the rât-like cunning of a yeggman, and Dr. Freud's interpretation of an iridescent dream. It has acquired so many meanings that its very diffuseness has made it almost meaningless. So it will not explain matters simply to say that our hunger for nostrums is a question of psychology, and that the nostrum venders must necessarily have been psychologists.

There are, to be sure, many kinds of psychologists nowadays; yet to most of us only two main groups exist—the theoretical and the practical.

The theoretical kind we visualize as college professors who try to take our minds apart and put them together again, and invent names for our different kinds of thoughts that we would never recognize the poor things by.

The practical or applied psychologists are individuals who specialize on figuring out how people are going to think about one certain thing. The inventor of poker must have been one of these, P. T. Barnum another, but nostrum venders were the deans of this school of psychology.

ALL ARE BELIEVERS IN MIRACLES

Truly, the explanation of the perennial youth of the "cure-all," of its endurance throughout the ages, is not an easy matter, since this endurance is deeply grounded in a weakness of human nature common to all peoples and all times—possibly in our primeval instinct to live. No one wants

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CURE-ALLS AND NOSTRUMS ARE OLDER THAN BABYLON ITSELF

The ancient Babylonian laws, called the Code of Hammurabi, contained penalties for malpractice and quackery, and also stipulated the amount of the fee which a physician might charge, the fee varying according to the ability of the patient to pay.

THE PYRAMIDS OF EGYPT: FORTY CENTURIES LOOK DOWN UPON THE OLDEST NOSTRUM IN THE WORLD—THE MEDICINAL COMPOUND KNOWN AS HIERA

The greatest names in medicine invented *hieras.* Scribonius Largus, physician to the Emperor Tiberius, is reputed to have had a "hiera" of such marvelous powers that when he died a diligent search was ordered in an effort to find the secret formula.

to die; few actually are ever convinced that they are going to die.

We are all really believers in miracles, and until comparatively recent days medicine and magic were closely associated. The Greek word "pharmakon" meant not only drugs, but also magic. We would all like to believe that somewhere is a fairy draught which once taken will make us free of pain, free of ills, young and vigorous. We have a secret sympathy with Ponce de Leon, who sought the fountain of youth and the alchemists who searched for the Elixir of Life were men like ourselves.

Perhaps here we have stumbled on the "psychology" of our ready acceptance of cure-alls.

"The medicines of every generation are ridiculous to the succeeding one," said a wise observer. Yet many a nostrum that started out as a secret formula, in the course of less than a generation became a recognized drug, used by the regular physicians.

There have been many such legitimized children of the pharmacopœia, of various degrees of antiquity, and at least one compound the use of which begins in prehistoric times and has continued down through the ages, even to the present day, changing very little in its constituents and not at all in its name. In England it is called *hiera-picra,* or powder of aloes and canella. Aloes is the active ingredient, and in every one of the numerous formulas except one aloes has always remained.

A NOSTRUM CHANGELESS AS THE HILLS

If William Hawkins, of London, 1917, owned a magic carpet which would trans-

Photograph by Katherine W. Stewart

GREAT PALMS ON THE SITE OF ANCIENT MEMPHIS: EGYPT

The walls of Memphis have crumbled and disappeared, but one of the nostrums prescribed by her learned men of medicine has come down through the musty centuries practically unchanged and is used today. Ptah Hotep, who wrote his proverbs 6,000 years ago, probably knew of it and used aloes in some form.

port him back to the city of Damascus about the year 1000, in that ancient Syro-Arab city he need only seek out a Jewish drug vender in the bazaar and whisper "hiera" and hierapicra, not much different from what is used today, would be forthcoming. "None other than the exact formula of the great Arab doctor, Avenzoar," the Jew would murmur.

Let him then go back to Rome in the day of Julius Cæsar and visit a "medicina" kept by one of the many Greek practitioners who flocked to the capital—barbers, corn-doctors, hair-dressers, herbalists, and other irregular quacks—and he could on demand receive "hiera" and be assured that it was the secret formula used by the priests of Æsculapius, "stolen from the temple, my lord," the crafty Greek would whisper.

Let him even go to Alexandria when it was building, or back to Memphis when the Pyramids were being planned, and the word *hiera* would evolve this same compound of aloes—the oldest nostrum in the world. And though possibly tasting a little different, it would have the identical action of the compound dispensed by the modern Lon-

don druggist under the name of "hiera-picra."

The greatest names in medicine invented *hieras*. Scribonius Largus, physician to the Emperor Tiberius, had a "hiera" so wonderful that when he died diligent search was made and a reward offered for the discovery of the formula. Back in the obscurity of mythology it took its origin, being used in the rites of Æsculapius, the god of medicine, by the Greek priests.

Greek doctors, Roman doctors, Arabian doctors, monkish doctors of the middle ages, and even modern doctors, had "improvements" on this eternal medicine, and all of these secret improvements were imitated by the quack doctors in every country and every period in the history of the world. Think of it—the dried juice of a common oriental plant marching down the musty centuries and enduring, while

"Kings and realms
Passed into darkness and were lost!"

Ptah Hotep, of Memphis, who lived and wrote his proverbs 6,000 years ago, and over 2,500 years before King Solomon, probably knew of and used aloes in some form. Beside antiquity like this the house of Hapsburg is infantile and the Hohenzollerns simply pre-embryonic.

THE ANCIENT LINEAGE OF COLD-CREAM

Most people at some time or another use cold-cream. It seems quite a modern luxury, indispensable alike to peer and peri, and adapted to many and varied uses. In fact, one traveler tells recently of having some of his cold-cream eaten by a fat-hungry valet in Germany. So we are inclined to regard it as a fairly modern product. And yet "Unguentum Refrigerans," cold-cream, has come down to us from Roman days. The first formula is attributed to Galen, who lived and wrote in the second century. What we use today is practically the same, though "Doctor" Galen's original formula was imitated and "improved" hundreds of times.

In the mellow days of the Renaissance, to be a monarch was even more exciting than it is now. New poisons were bought as eagerly by "liberal" citizens of that

Photograph from C. L. Aab

A FAMOUS CURE-ALL OF THE DARK AGES

The medieval medicine man, upon securing such an Egyptian "antique," would (to translate his announcement into the modern vernacular) have advertised to his patients the receipt of another large consignment of dried mummy, imported in its original mummy case, direct from the tombs of the ancients on the banks of the Nile—a sure panacea for all the ills that flesh is heir to.

Photograph from Rear-Admiral Colby M. Chester

HIERA-PICRA, SIMILAR IN ITS ESSENTIAL INGREDIENTS TO A POPULAR PANACEA OF TODAY, WAS SOLD IN DAMASCUS A THOUSAND YEARS AGO

The use of this compound began in prehistoric times and has continued to the present day. Aloes is the active ingredient. The drug vender who sold it in the bazaar of the ancient Syro-Arab city in the year 1000 was dispensing the same article that the Roman "medicina" of Julius Cæsar's time sold as "the secret formula used by the priests of Æsculapius."

PALERMO, THE CORONATION CITY OF FREDERICK II, THE DR. WILEY OF THE THIRTEENTH CENTURY

Frederick, King of Sicily and later Roman emperor, was an advanced thinker. He promulgated decrees providing penalties for the sale of impure drugs; by his order, physicians were not allowed to enter the drug business; quackery was severely punished, and high standards of education were set for medical students.

A MEDICINE-SHOW MAN OF THE MIDDLE AGES

Testimonials and public demonstrations of the curative powers of nostrums were the methods employed by quacks of the middle ages, as chronicled in this painting. As it is true that human nature is much the same from generation to generation, so the practices of charlatans vary little through the centuries. Refinements of humbuggery are adopted only as the intelligence of the clientele rises.

period as spring medicines used to be by us, and to a king a meal in those days was as perilous an undertaking as a yachting cruise in a mine field would be today. It is not surprising, therefore, that many nostrums were invented with the avowed purpose of neutralizing any poison that might be taken internally.

Mithradatium was the name of the great antidote of Roman pharmacy. It had from 40 to 50 vegetable ingredients, few of which had any real medicinal value except opium, and these drugs were blended with honey.

It remained for Nero's physician, Andromachus, to put the finishing touches to this wonderful compound. Andromachus added viper's flesh to the formula and called his new compound Theriaca. He wrote some verses dedicated to Nero, describing this medicine and claiming virtues for it which in our day would subject him to prosecution under the Anti-trust Act. Evidently he believed he had created in this one compound a veritable pharmaceutical monopoly.

A MEDICINE WITH A MONOPOLY ON DISEASES

Galen, one of the fathers of medicine, went even further. He recommended it as a cure for all poisons, bites, headaches, vertigo, deafness, epilepsy, apoplexy, dimness of sight, loss of voice, asthma, coughs, spitting of blood, tightness of breath, colic, the iliac passion (appendi-

PADUA, ONE OF THE CENTERS FOR THE MANUFACTURE OF VENETIAN TREACLE IN THE MIDDLE AGES

Theriaca, or Venetian treacle, was the great antidote of Roman pharmacy and was used throughout the ages in various modifications for almost every conceivable illness. It was officially recognized by English physicians until 1788. The university cities of Italy were the centers for its manufacture until Venice obtained a practical monopoly of the whole export trade in drugs.

citis), jaundice, hardening of the spleen, stone, fevers, dropsy, leprosy, melancholy, all pestilences, etc. Nowadays he would probably have included coupon thumb, golf shoulder, and movie eye.

As Galen's writings dominated medical thought for over 1,500 years, it is not surprising that this advertisement made Mithradatium, or Theriaca, a valued remedy. Every physician of note for centuries afterward claimed some improvement on the original formula.

And the "genuine formulas" or the "improved formulas" were hawked about by many a nostrum vender, until all sorts of precautions were taken to hedge the making of this preparation with an elaborate ritual of a ceremonial nature.

An old English book of "Leechcraft" tells of a letter of Helias, Patriarch of Jerusalem, to King Alfred, expressing concern for the King's illness and recommending "Tyriaca" as a valuable remedy.

The specific was first made at Constantinople, then at Genoa, and finally at Venice, when that city perfected its monopoly of the drug trade of Europe. This Venetian Treacle, as it came to be called, was sold at high prices. Evelyn, in his diary, speaks of purchasing some "treacle" in Venice after having seen the ceremony of its compounding.

In Queen Elizabeth's time there was much complaint in England of the dearness of Venetian Treacle, and of the spurious treacle sold by nostrum venders. It was about this time that English pharmacists began to presume to make their

A FAMOUS PAINTING WHICH CHRONICLES THE OCCASION WHEN AMBROISE PARE ABANDONED THE PRACTICE OF SEARING THE ENDS OF AMPUTATED LIMBS WITH BOILING OIL. HE SUBSTITUTED LIGATURES

Ambroise Pare, who lived almost from the beginning to the end of the sixteenth century, began life as a barber's apprentice. He became the most famous military surgeon of his age, reviving the use of ligatures to prevent hemorrhage. He protested against the use of dried mummy and bezoar stones as cure-alls, and to him is attributed the invention of artificial limbs and eyes.

own treacle. Spies had been sent to Venice to worm out the exact identity of the ingredients and the process of their manipulation, and finally a suitable product was made at home.

The making of treacle was an occasion not to be taken lightly. Witness the recorded speech in the "Chronicles of Pharmacy" of one Laurence Catelan, Master Apothecary of Montpellier and Apothecary to the Prince of Condé, which was delivered when he prepared a batch of Theriaca at Montpellier on September 28, 1668.

To the assembled multitude Master Catelan enumerated the regulations which compelled him to prepare this great remedy in public in the presence of the "illustrious professors of the famous University of Medicine." All this pomp and circumstance was, of course, a pure drug-inspection procedure, invented to discourage the vending of spurious products. Master Catelan proceeded to relate the wonderful history of Mithridates, who had rendered himself immune to all poisons, and of the formula he had left to posterity.

THE FABLE OF THE POISON-PROOF KING

This Mithridates, concerning whom Master Catelan spoke, known in history as Mithridates the Great, King of Pontus, was born 134 B. C., and, next to Hannibal, was the most dangerous foe against which the Roman Republic had to war. After wars lasting 26 years, Pompey's armies finally conquered him.

Mithridates was reputed to have been immune from poison because of a compound which he had prepared and which he took each day; so that when, being defeated, he attempted suicide, no poison of the many he tried would cause his death. Consequently he had to call in one of his soldiers, who killed him with a spear. Such was the fable.

Stories of Mithridates' medical lore had long been told the conquering Romans, whetting their curiosity. They searched eagerly amongst his papers at Nicopolis and found, it is true, some medicinal formulas, but none of any great value. It is quite likely, though Master Catelan firmly believed in its authenticity, that this legend originated in Rome much later and was disseminated "next to pure reading matter" by the nostrum venders, who made Mithridatium Antidote and sold quantities of it. But Master Catelan related the Mithridatium fable with almost devotional zeal, and told, as well, the later history of the compound, dwelling particularly on the many improvements made in it and leading up to its present pinnacle of perfection. The speaker then rested, while some soft music was played.

SAVING ALEXANDER FROM THE VENOM-SATURATED SLAVE GIRL

Resuming, Master Catelan told many marvelous tales of princes who had escaped poisoning by immunization. One incident, on which he dwelt with special emphasis, concerned Alexander the Great. An Indian prince who hated Alexander sent to him as a gift a beautiful slave girl whose system had been so saturated with aconite that she fairly reeked of poison. It was thought that Alexander, struck with her beauty, might kiss her and be poisoned by her surcharged venom. But Aristotle saw her first, recognized by her flaming eyes that the girl was a poison-carrier, and by sending her away saved his patron's life.

After this the lecturer naturally took another rest and there was some more music.

The virtues of the half-hundred ingredients were then dwelt upon, which took up the remainder of the day. The actual mixing of the drugs took place on the following day, but the final ceremony was not concluded for nearly two months. Such was the elaborate program for the manufacture of this compound.

The manufacture of English theriaca was as much due to the prevalence in the market of adulterated products as to the high price of the imported article. Many protests of the guilds are recorded against the false treacle which was being sold in England.

From the point of view of medicinal value, however, the false product was probably quite as effectual as the true, both being almost worthless. That the medical profession was slow to realize

ONE OF THE FIRST ILLUSTRATED BOOKS ON DRUGS, PUBLISHED THE YEAR BEFORE COLUMBUS DISCOVERED AMERICA

A photograph of the hand-illuminated pages of Johannis de Cuba's famous "Hortus Sanitatis," part of which is devoted to the use of precious stones in medicine. The upper half of the left-hand page shows a teacher in doctor's gown instructing a pupil in the use of stones and the lower illustration shows a lapidary-apothecary's shop with customers buying medicine rocks. This book is one of the priceless volumes in the library of the Surgeon General, U. S. A., in Washington.

this can be inferred from the fact that the compound was officially recognized by the English pharmacopœia until 1788.

A THIRTEENTH CENTURY FORERUNNER OF DR. WILEY

Emperor Frederick II of Sicily, in 1240 or 1241, published the first pure food and drugs act. He was about 700 years ahead of Doctor Wiley, for he specified strict regulations of the standard of drug purity, and provided for drug inspectors, and fined all offenders.

The practice of medicine was also regulated. A physician was required to have a diploma from a university before he could study medicine; then he took a three-year course in the school of medicine and one year practice under a practicing physician. Special postgraduate work in anatomy was required if he was to do surgery.

All this was in the so-called "dark ages." Even the fees of physicians and pharmacists were strictly regulated by law and were in purchasing value about the same as the charges of the present day. Physicians were not allowed to own drug-stores and drug adulterators were severely dealt with.

The idea of general antidotes for poisons was a very ancient and very generally accepted belief. Some of us probably remember the "mad-stones" which not so very long ago were applied to mad-dog bites to "draw out the poison." These mad-stones were unquestionably direct traditional descendants of the bezoar stones of ancient days.

BEZOAR STONES RENTED TO PLAGUE VICTIMS

Bezoar stones acquired their reputation in the East, among the Arab practitioners. Avenzoar, a great Arabian writer on medicine, who lived in Seville about the year 1000, was the first European practitioner to write about these supposedly wonderful stones. But a little over a century ago the Shah of Persia sent his brother monarch, the Emperor Napoleon, three bezoar stones as a very proper precaution against the effects of poison.

Bezoar stones were used as a general antidote against poisons, from four to ten grains being given at a dose. Externally they had a wide variety of uses, being applied in fevers, in various skin diseases, and even as a cure for leprosy. Nobles and princes carried them about in jeweled boxes as amulets. Wily speculators, in times of epidemics, as during the plague in Portugal, rented them out at the equivalent of about £5 a day, requiring a bond for their return.

Many kinds of bezoar were sold, but the most valuable were the Oriental kind, *lapis bezoar orientale*. This came from Persia and was obtained from the intestines of a Persian wild goat. It was merely a sort of petrification formed by the digestive juices about some foreign substance in the goat's intestines. But the medical authorities of that day thought that the stone was formed by some mysterious medicinal plant on which these animals fed.

A certain Oriental ape also yielded bezoar stones. The directions were first to catch your ape and then give him an emetic. Similar stones were obtained from the llamas of Peru, and from the Swiss chamois. But the Eastern products commanded the market, and were said to have sold for ten times their weight in gold.

THE SALE OF IMITATION BEZOAR STONES EXPOSED

Naturally, this supposedly valuable stone would be imitated. It was, and a certain Mr. Slare, a Fellow of the Royal College of Surgeons in London, read a paper in 1714, in which he exposed the substitution. One wholesale druggist told Mr. Slare he had 500 ounces of bezoar in stock, and Mr. Slare, being an old-time statistician, estimated that it would require the slaughter of 50,000 goats annually to supply this one dealer. As no such terrible mortality had occurred among the Persian goats, Mr. Slare asked the pertinent question: "Where did they get it?"

In the records of the Royal Society of Apothecaries, May 25, 1630, is the following entry: "Pretended bezoar stones sent by the Lord Mayor to be viewed were found to be false and counterfeit and fit to be destroyed, and the whole

table certified the same to the Lord Mayor."

Ambroise Pare, a great military surgeon of the 16th century, is credited with discontinuing the practice of searing the stumps of amputated limbs with boiling pitch, and instead successfully using ligatures to tie the bleeding vessels. He did not believe in the virtues of bezoar stones. One day when he was in attendance on King Charles IX at Clermont, a Spanish nobleman brought a bezoar stone to the King, assuring him that it would protect him against all poisons.

A WISE PHYSICIAN, A CREDULOUS KING, AND AN UNFORTUNATE COOK

Pare says his monarch sent for him and asked if there was anything which could act as a general poison antidote. Pare replied that, as various poisons differed in their nature, the antidotes would necessarily differ. But the nobleman persisted in his statement and aroused the desire of the King to test the virtues of the stone, which he proceeded to do in a ruthlessly conclusive manner.

The Provost of the Palace was summoned and asked if he had in his charge any criminal awaiting the execution of the death sentence. The Provost bethought himself of a cook who was to be hanged for the theft of two silver dishes.

The King thereupon sent for the cook and proposed to him that in place of hanging he should be given a poison, to be followed by the universal antidote, and if the antidote proved efficacious he would be given his liberty. The cook gladly consented.

An apothecary was instructed to prepare a draught of deadly poison. This was administered and followed by a dose of the powdered bezoar. The unfortunate victim died in horrible agony seven hours later, in spite of all Pare's efforts to relieve him. The pharmacist had given him bichloride of mercury. An autopsy was then performed and Pare demonstrated to the King that the bezoar had not the slightest effect in counteracting the corrosive action of the poison.

"And the King commended that the stone be thrown in the fire, which was done," Pare succinctly concluded. It is not stated whether the Spanish nobleman suffered the same fate, but he must at least have had an uncomfortable hour or two.

QUEEN ELIZABETH THE PATRON OF PATENT MEDICINES

The patent-medicine business in England, viewed as a distinct trade monopoly, really took definite form during the reign of Queen Elizabeth. Both Elizabeth and James I abused this assumed arbitrary power of granting monopolies of various sorts, until great discontent was produced amongst the people. The Statute of Monopolies, passed in 1624, regulated all such grants, placing authority in the hands of Parliament. The period of duration was likewise limited to 14 years. In the beginning, specifications of methods or formulas were not required; but during the period of Queen Anne applicants began to be required to file these specifications. As secrecy was an important element in the success of nostrums, this ruling tended to discourage the patenting of medicines until in 1800 medicinal compounds were patented but rarely.

Of course, the term "patent medicine" nowadays is a misnomer, as few of these preparations are patented. The property right is protected by copyrighting the label or registering it as a "trade-mark," thus preventing competition in the use of the *name* of the preparation.

CENTURIES-OLD FAVORITES STILL SOLD

The oldest patent preparation still made in large quantities in Great Britain is probably Anderson Scot's Pills, patented under King James II in 1687. Formulas of these pills appeared in all the manuals on pharmacy published in Europe and America in earlier days. Their activity depends largely on aloes. Duffey's Elixir, invented by a clergyman, the Reverend Thomas Duffey, in Leicestershire, in 1675, is still advertised and sold, and the old-fashioned advertisement in which the bottle is wrapped states that the elixir was "much recommended to the public by Dr. King, physician to King Charles II," an argument somewhat belated, to say the least.

Haarlem Oil, a turpentine compound, made first in 1672, and Godfrey's Cordial, a preparation of opium, advertised first in 1722, are still bought by the public.

Goddard's Drops was a remedy to which Salmon, a contemporary of Charles II, refers as "the true medicine which was purchased of the Doctor by King Charles the Second, so much famed throughout the whole Kingdom and for which he gave him, as it is reputed, fifteen hundred pounds sterling." Other writers state that Charles paid £5,000 for the formula.

The formula consisted of a distillate "of humane bones or rather scales," which were to be "well dryed." These were distilled until "a Flegm, Spirit, Oyl, and Volatile salt were obtained." The product was digested in the earth for three months, digested at a gentle heat for 14 days, and the "oyl" separated and bottled.

DRIED MUMMY A POPULAR REMEDY

Animal products were much used in medicine from the sixteenth to the eighteenth century. Dried mummy was a favorite remedy. The importation of mummy was an industry of some commercial importance and several writers of that day caution against the use of spurious mummy, giving directions as to what distinguishes the good from the poor product.

There was much substitution here, and one Jewish dealer was found to have done an extensive trade in bodies dried in imitation of the genuine article.

One of the most picturesque careers in medical charlatanry of a more modern day was that of St. John Long, a handsome and clever Irish quack, who practiced in London early in the nineteenth century. He had attractively furnished offices in Harley Square and pretended to cure many diseases, notably tuberculosis, by the application of a liniment and the inhalation of a vapor. His consulting rooms were crowded with fashionable and noble patrons and he was reputed to have an income of £65,000 a year.

A FIFTEENTH CENTURY ILLUSTRATION WHICH SHOWS THE METHOD OF EXTRACTING A CURATIVE TOADSTONE

The idea of a stone in the head of the toad was not confined to the literature of medicine. Shakespeare spoke of adversity, "which, like the toad, ugly and venomous, wears yet a precious jewel in his head."

He was tried for manslaughter twice. Once he was required to pay a fine of £1,250, which he produced from his pocket and counted out, afterward driving away from the court in the carriage of the Marquis of Sligo. At the second trial he was acquitted. He died in 1837, at the age of 37, from pulmonary tuberculosis, the disease which he purported to cure. The formula of his liniment after his death was sold for £50,000, but never sustained its previous popularity. It was composed principally of turpentine, acetic acid, and egg yolk.

Even the English Parliament has been gulled by the "cure-all" vender. In 1739 an act was passed "providing a reward to Joanna Stephens upon the proper discovery to be made by her for the use of the publick of the medicines prepared by her for the Cure of the Stone."

The formula, when published, consisted of a solution of the products re-

ENTERING A MEDICINE LODGE: GLACIER NATIONAL PARK

The Indian medicine man is a survival in modern days of the most ancient ideas of medicine.

sulting from calcining egg shells and garden snails. An alkaline vegetable decoction and some pills made from calcined snails and some burned vegetable drugs comprised the "cure." Horace Walpole is said to have taken this awful mess in the belief that it helped him. Lime water would have been just as efficacious.

THE QUACKS WHO TREATED BEASTS AND BISHOPS ALIKE

The Taylors, known as the Whitworth Doctors, inventors of the Whitworth Red Bottle and the Whitworth Drops, flourished at Whitworth during the same period. The original Taylor was a farrier, who was also an unqualified veterinarian. He died in 1802. His young brother, his sons, and their descendants all practiced surgery, mostly irregularly, although some of them were qualified. The older brothers applied horse remedies to human beings, treating man and beast alike. People came to these ignorant men from every quarter of England, crowding the small village near Rochdale. Duchesses and princesses and bishops—all came to the Whitworths; rarely the "Doctors" went to London.

The fame of the Whitworths still lingers in rural England and the sale of the "remedies "continues.

Nostrum makers have not confined their attention to the humble citizen. Some of the most notorious quacks have been favored by royalty. John Ward, who manufactured Ward's Pills and Ward's Drops and many other remedies in Paris and London, had no medical training, but included among his patients Lord Chesterfield, Gibbon the historian, Fielding the novelist, and was so well thought of by George II that the King opened a dispensary at Whitehall and paid Ward to treat poor patients there. When, in 1748, a bill was introduced in Parliament to restrict the practice of medicine, the act contained a clause specifically exempting Ward from its penalties.

Queen Charlotte on one occasion asked General Churchill if it was true that Ward's medicines once made a man mad. "Yes, Madam," said Churchill; "his name is Mead." Richard Mead was the regular physician to the King.

A DRAWING WHICH DEPICTS THE ADMINISTRATION OF A BEZOAR TO CURE A VICTIM OF POISONING

An illustration from "Hortus Sanitatis," published in 1491. "Mad-stones," which only a few years ago were applied to "draw out the poison" from mad-dog bites, were direct traditional descendants of these Bezoar stones of the ancients.

The history of nostrum making in America, of the fortunes builded on it, and the frauds practiced on the credulous public, has been well told by other writers—so well told that as a nation we are ceasing to be the greatest nostrum users in the world.

The alcohol medicines, the cocaine medicines, the opium medicines, and their less actively harmful associates, the sarsaparillas, etc., have had their day, and their use has declined in every section of the country. The Council on Pharmacy of the American Medical Association holds the members of that influential body to a strict code of requirements in the matter of the kind of drug compounds they prescribe, and even compounds not advertised to the public must nowadays toe the ethical mark.

IT IS NOT NECESSARY TO GO BACK TO MEDIEVAL TIMES TO FIND WITCH DOCTORS; THEY ARE PLYING THEIR PROFESSION TODAY IN NATAL, SOUTH AFRICA

But in civilized countries, the day of the medical charlatan is at an end. Occasionally there are "flare-ups," but when secrecy about formulas and practices was abolished it became impossible for pretenders to hold sway over popular imagination for any length of time. Today, the physician who refuses to share with the world his knowledge of a discovery that will benefit mankind suffers social and professional ostracism.

THE DOOM OF THE NOSTRUM SOUNDED

Today, despite "flare-ups" like Friedman's tuberculosis turtle cure and enthusiasms like "twilight slumber," the exploiting of specific remedies is on the decline. The vogue of the Wards and the Whitworths has passed away.

Standards of regulation of the purity of drugs, rigidly enforced ethical codes among physicians, prescribed and standardized formulas in national "pharmacopœias" or formularies, and, most of all, campaigns in magazines, both lay and medical, to instruct the people in public health and sanitation, especially in the United States, have sounded the doom of the nostrum and the cure-all. No more are outlaw remedies made legitimate and admitted to the Pharmacopœia, for the prescribing of drugs is being put on a rational basis and the explanation of the *reason why* medicines produce certain effects is becoming more and more of an exact science. The magical lure of ancient pharmacy has departed.

There are today no secrets in medicine, and the physician who makes a discovery that will benefit the human race must either share it with his fellows or suffer social and professional ostracism.

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THE NATIONAL GEOGRAPHIC MAGAZINE

THE NORTH SEA MINE BARRAGE*

By Capt. Reginald R. Belknap, U. S. N.

SAVAGE beasts are trapped most easily near their dens. That is the action which our Navy Department urged against the enemy submarine campaign.

From the moment of entering into the war, our Navy advocated strong offensive measures to block the German bases, so that no more submarines, or very few, might get out, and those returning might be caught and destroyed.

Now, the German forces were very strong for operations near their own coast, and although the British destroyers were constantly planting mines in the Helgoland Bight, they could not prevent the German mine-sweepers from keeping channels open through these mine fields.

ELEMENTS WHICH AIDED THE ENEMY AND HANDICAPPED THE ALLIES

The enemy even had special vessels called barrage-breakers, and they were also very much assisted by bad weather, fogs, and variable currents, which handicapped the Germans much less than the British, who had to operate from a starting point farther away.

There was also the Skagerrack passage between Denmark and Norway, where no barrier could be placed without violating neutral waters. Consequently, the enemy submarines could always use this channel going to and from their bases at Kiel and Wilhelmshaven.

Any barriers that the allied navies could place near the German coast and near the Skagerrack were so close to the German bases that the enemy could at any time break through at some point by suddenly attacking there with more force than the allies could maintain over any one section of the whole line, so far away from the bases in Great Britain. Just as in a game of football, no matter how strong the line is, a wedge of two or three players together, striking the line in one place can nearly always break through before more men can get there to stop them. That was the situation eighteen months ago.

There were mines in plenty near the German coast, forcing all enemy craft to be very careful and now and then doing them some damage; but the submarines could still go in or out. The barrier close to the German coast could not be made effective

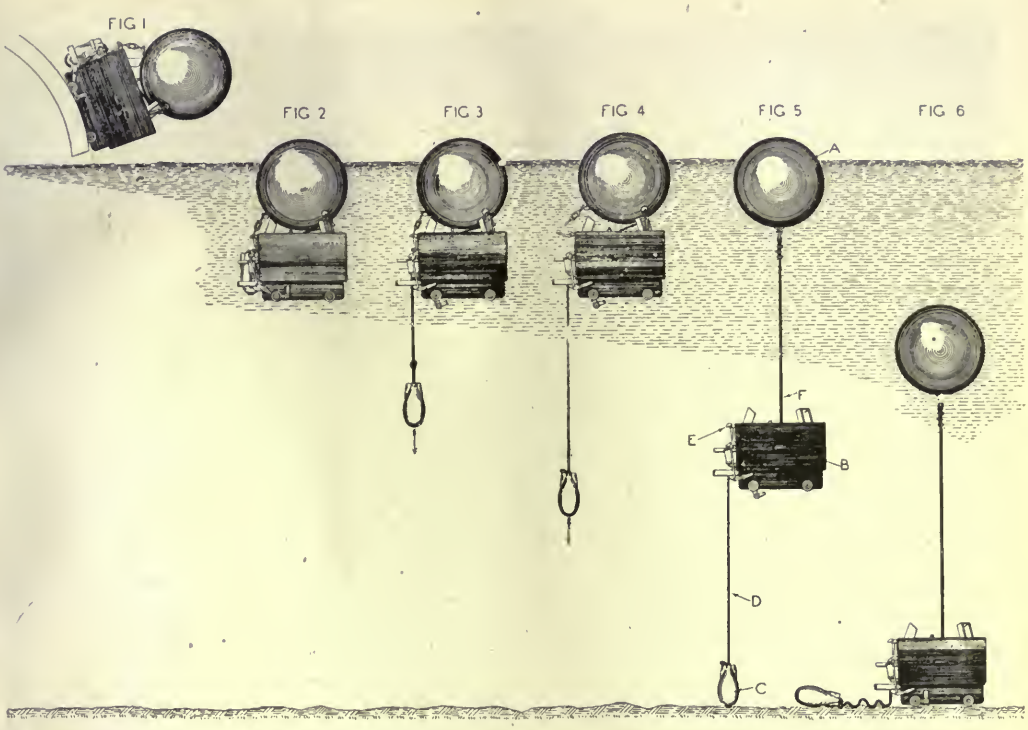
AN AMERICAN INVENTOR'S IDEA ADAPTED BY THE BUREAU OF ORDNANCE

As soon as America went into the war a flood of inventions poured into Washington—all kinds of schemes for winning the war. Among them was one by an American electrician, which, though unsuited for naval purposes in the form in which submitted, had one part that was adaptable to a submarine mine, offering great

* An address delivered by Capt. Reginald R. Belknap, U. S. N., before the National Geographic Society, in Washington, D. C., February 7, 1919. Captain Belknap was the officer in direct command of the American Navy's mine-laying squadron.

CHART OF THE NORTH SEA, SHOWING THE LOCATION OF THE MINE BARRAGE LAID BY THE AMERICAN AND BRITISH MINING SQUADRONS

When this mine barrage was found to be effective, Germany realized that her submarine warfare had failed and that the ultimate defeat of her land forces was inevitable (see also detailed map of the mine field on page 109).



HOW A MINE IS ANCHORED AT THE DESIRED DEPTH BELOW THE SURFACE OF THE SEA

The progress of a mine after it is thrown overboard is shown in Figures 1 to 6. When a mine is dropped overboard, the mine proper (A) floats, while the box-like anchor (B) slowly sinks. Inside the anchor is the mooring wire (F), which unwinds from a reel as the anchor sinks. The reel is unlatched (E) by the downward pull of a plummet (C) at the end of a cord (D), which is made the same length as it is desired to have the mine stay below the surface. The plummet, being nearly solid metal, sinks faster than the more bulky anchor box (see Fig. 3), thus keeping the cord (D) taut. As soon as the plummet strikes bottom, however, the cord slackens and the reel in the anchor box is locked, thus preventing any more mooring wire from unwinding. The anchor continues to sink, pulling the mine case under the water until the anchor strikes bottom, as in Fig. 6 (see text, page 91).

possibilities, especially against submarines.*

After putting it through some tests, the Naval Bureau of Ordnance felt confident that here was what they were looking for. It was not long before the British naval authorities came to think so too, and a joint operation was projected, to be undertaken by the mining squadrons of the two navies.

The plan was to plant a mine field across the North Sea, from Scotland to Norway, a distance of 230 miles, or as far as from Boston to New York. It was a bold scheme; some said foolish, impossible. Nothing like it had ever been undertaken. Moreover, for lack of time, tens of millions would have to be spent outright, by the British as well as ourselves, before a single mine could be tested complete—most unusual procedure, requiring great administrative courage on the part of Rear Admiral Ralph Earle, Chief of the Naval Bureau of Ordnance, upon whom the odium would have fallen had the mine proved a failure. But it was the only way to make an

* The inventor to whom the author refers was Mr. Ralph C. Browne, of Salem, Mass., whose design for a submarine gun was adjudged impractical. One of the elements of this gun, however, was recognized by Commander S. P. Fullinwider, U. S. N., and his assistant, Lieutenant Commander T. S. Wilkinson, Jr., U. S. N., in the Bureau of Naval Ordnance, as having great possibilities if adapted to a mine against submarines. Mr. Browne gladly acceded to the Naval Ordnance Bureau's request to collaborate with its experts in the development of such a mine.

AMERICAN BLUEJACKETS ADJUSTING THE DELICATE MECHANISM WHICH CHANGES A MINE FROM A HARMLESS, INSENSATE BALL OF STEEL TO CONCENTRATED CATACLYSM FOR ANYTHING WHICH TOUCHES IT

effective barrier that could be maintained against attempts to break through (see maps on opposite page and on page 109).

If mines of previous types were used their number was prohibitive, impossible to manufacture or provide with explosive within two years, under existing conditions, not to mention the task of planting; but the new American mine would do more than twice what the others could, and the joining of our mining forces with the British would more than double the means available.

From the outset, the operation was seen to be of great magnitude, with a mass of detail requiring constant foresight and careful adjustment. Besides the bigness, other features promised great difficulty, such as deep water, 300 to 900 feet, danger to the mine-layers from their own mine fields in bad weather and fog, and inexperience of the large proportion of new personnel.

Fortunately, our Navy had been developing a mining force for nearly three years. It was small but well trained, and it looked upon difficulties only as things to be overcome. On the strength of its own experience, this force was confident that the large operation could be accomplished.

Likewise, the British, with their three years' experience in the war and knowledge of North Sea weather, felt sure it could be done.

Difficult in many ways, seen and also unseen—venturesome, arduous, and very hazardous—it was all of these beyond any doubt; yet, if only half successful, the operation would go far toward beating the submarines, and it *could be done*. So it was undertaken. From the President down, every one in authority was strong for it.

THE ORDER: "GO AHEAD"

All these preliminaries take time, and the new invention itself had to be put through severe trials before we could feel sure enough; but by the end of October,

STORED LIKE GIANT EGGS IN A GIGANTIC CRATE

A warehouse containing some of the 70,117 mines which were laid jointly by the British and American mine-laying squadrons in the North Sea. Four-fifths of the mines were laid by American ships. The actual casualties inflicted on the enemy submarine fleet probably will never be known, but the Germans themselves are said to admit the loss of 23 undersea boats in this area. The British admiralty staff hold that the surrender of the German fleet and the armistice were caused largely by the failure of the submarine warfare (see text, page 109).

1917, the definite order was given to go ahead. The Secretary of the Navy, Josephus Daniels, expressed the desire for the best efforts of all who might be concerned, and offered his own further action or influence whenever needed.

Coöperation in the fullest measure was necessary from the start. Over 500 contractors and subcontractors were soon engaged in the manufacture of the many parts, small and large, that go into the make-up of a complete mine.

Besides being a rush order all through, the task was complicated by the necessity for keeping parts of the mine secret. Some pieces had to be made here and others there and both kinds sent to a third place to be joined, and all of the parts were finally delivered at Norfolk, Va., for shipment to Scotland, where the complete mines were to be assembled and adjusted, ready to plant.

Such a manufacturing task would demand the utmost care in ordinary times. The hurry and pressure and disturbances due to war conditions added many difficulties; yet, so great was the interest and so well was the operation's importance understood, there was no halting nor slighting of the work anywhere.

A submarine mine of today consists of a mine case, shaped like a ball or egg, about one yard in diameter, and an anchor in the form of an iron box about two feet square, connected by a wire rope mooring cable the size of one's little finger. The mine case contains the charge of high explosive—300 pounds of TNT in our mines—and the firing mechanism.

When assembled, the mine case is mounted on the anchor, the combination standing about five feet high and weighing 1,400 pounds. The anchor has four small wheels, like car wheels, to run on steel tracks, and thus the mines may be easily moved along the decks to the launching point.

WHEN THE MINE GOES OVERBOARD

When the mine goes overboard, the mine case floats on the surface, while the

A WET WINTER MORNING AT A U. S. NAVAL BASE IN FOG-AND-MIST-DRENCHED SCOTLAND

American mine material was unloaded on the west side of Scotland and thence the cargoes were forwarded by canal barges and by rail to Inverness and Invergordon, on Cromarty Firth. These harbors open on Moray Firth, about eight miles apart, on the northeast coast of Scotland.

TRUCKING TONS OF TNT AT A U. S. NAVAL BASE IN SCOTLAND

These black globes of imprisoned death will be attached to their box anchors and then transferred to the mine-laying vessels of the American Navy.

box-like anchor slowly sinks. Inside the anchor the mooring wire is wound on a reel, which unwinds as the anchor goes down. This reel is unlatched by the downward pull of a plummet at the end of a cord, which is made the same length that it is desired to have the mine stay below the surface. Thus, if the mine is to be 15 feet beneath the surface, the plummet cord is 15 feet long.

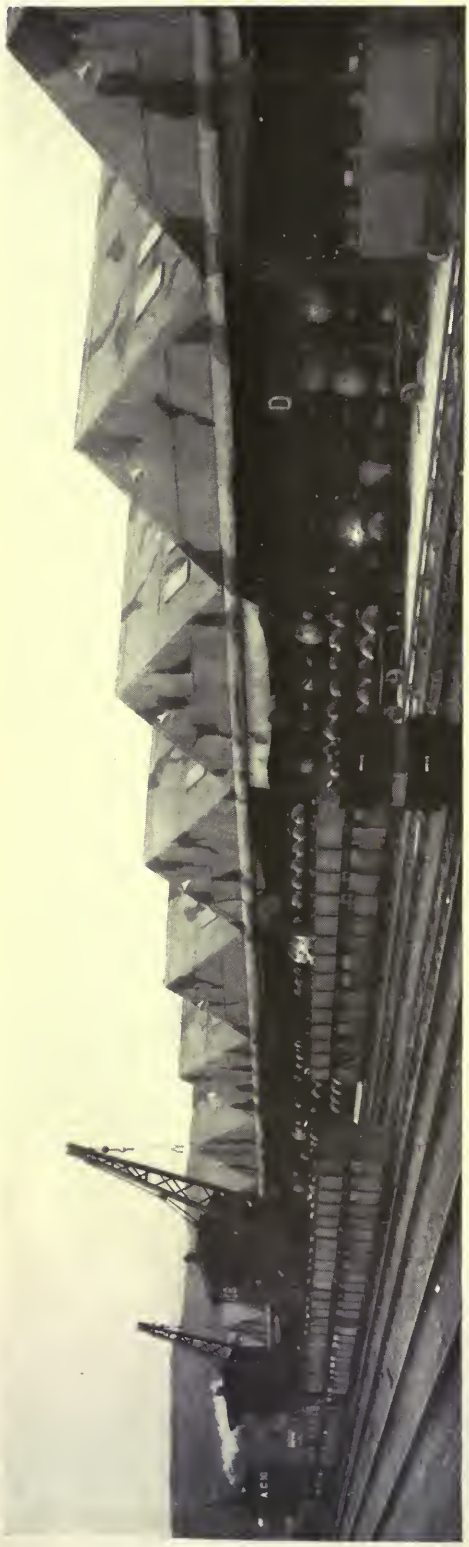
The plummet, being nearly solid and quite heavy, about 90 pounds, tends to sink faster than the more bulky anchor, thus keeping the cord taut; but as soon as the plummet strikes bottom, its cord is at once slackened, releasing the latch, locking the reel, and preventing any more mooring wire paying out. The anchor continues to sink, pulling the mine case under water until the anchor strikes bottom.

The mine case is thus finally moored always at the desired depth beneath the surface, no matter how irregular the ocean bed may be. The mermaids would see our summer's work like a vast field of tulip buds 50 feet or so under water, swaying on their long, slender stems.

The mine cases are buoyant enough to pull straight up from their anchors ordinarily, but in a current they are swayed away from the vertical, which drags them down somewhat deeper than intended. For this reason, any locality where the currents are strong is unfavorable for a mine field. This was one of the difficulties the British Navy had to contend with in closing the Straits of Dover.

To receive the large amount of mine material and general supplies that soon began to collect, a large steamship pier was taken over at Norfolk, to serve as a storage as well as loading point.

Near by a plant was constructed for charging the mine spheres with explosive—great steam kettles for melting the TNT, which was poured into the spheres. Then these would move along on a conveyor, slowly, so that by the time the sphere reached the end it was cool enough



THOUSANDS OF MINES AND MINE ANCHORS STORED IN CAMOUFLAGED SHEDS PREPARATORY TO BEING TRANSFERRED TO MINE LIGHTERS

These mines were sown like peas in the furrows of the North Sea for a distance of 230 miles, as far as from Boston to New York.

either to load into a waiting ship or to put away in store.

CONSTANT DANGER IN THE WORK

This work was a constant danger from fire risk and the poisonous fumes of the molten explosive. The sailors in attendance had to wash their heads and necks thoroughly afterward. Several were overcome seriously in the course of the work, and one man died; but the rest quietly stuck to it, as if they liked it.

There was a great transportation problem involved, originally estimated to absorb the use of 60,000 tons of shipping for five months. Beginning their sailings in late February, a group of 24 steamers, managed by the Naval Overseas Transport Service, were constantly employed, with two or three departures every eight days, carrying mine material and stores for the northern barrage.

It was through a submarine sinking one of these ships, the *Lake Moor,* with 41 of her crew, that our operation suffered its greatest, almost the only, loss of life.

Meantime the British naval authorities were preparing depots for us in Scotland. The mine material was to be unloaded on the west side of Scotland; some cargoes at Fort William, at the western terminus of the Caledonian Canal, and some at Kyle, on Loch Alsh, opposite the Isle of Skye.

Thence the cargoes would be forwarded by canal barge and by rail to Inverness, and to Invergordon, on Cromarty Firth, respectively. These harbors open on Moray Firth, about eight miles apart, on the northeast coast of Scotland (see map, page 86).

A single depot would have been better, as far as assembling the mines was concerned, but the limited transporting capacity by canal and Highland railway made two assembling points necessary.

A TRAINLOAD OF AMERICAN MINES PROCEEDING TO THE EMBARKING QUAY

The big steel bubbles strewn about in the foreground are each filled with 300 pounds of TNT, one of the most powerful explosives used during the world war.

TRANSFERRING MINES FROM RAILROAD CARS TO LIGHTERS

A mine, shaped like a ball or an egg, is about one yard in diameter. With its iron box anchor, two feet square, and its wire mooring cable, it weighs 1,400 pounds.

LIGHTERS CONTAINING MINES GOING ALONGSIDE THE "SAN FRANCISCO," FLAGSHIP OF THE AMERICAN SQUARON: INVERNESS FIRTH, SCOTLAND

The *San Francisco* and the *Baltimore* each carried 350 mines at a time, while four new ships could carry 860 each, two others 610 each, and the remaining two 350 (see text, page 96).

Our Captain Murfin was sent over in November, 1917, to supervise the preparation of these bases and be in charge of them when completed. The buildings, grounds, and adjacent vacant land of two idle distilleries afforded good accommodation for offices, men's quarters, messrooms, kitchens, and storage and ample space for erecting the mine assembly and storage plant.

When finished, these bases could together prepare 1,000 mines a day. Captain Murfin had twenty officers and a thousand men at each base and two outlying detachments, of three officers and sixty men each, at the unloading points—Fort William and Kyle.

With every reason to establish the mine-field barrier at the earliest possible date, the estimated rate at which the new mines could be manufactured was taken as the basis for determining the capacity of the new mine-laying squadron.

It was expected that the output would be 1,000 mines a day, and that one mine-laying operation could be accomplished at best in five days for the round trip. Hence the mine-laying squadron should have an aggregate capacity of 5,000 mines.

THE MINE SQUADRON

We had two ships to begin with—the *San Francisco,* Capt. Henry V. Butler, and the *Baltimore,* Capt. Albert W. Marshall. They were fine old war horses, dating back 28 years, but sound in wind and limb and as responsive as any thoroughbred. They and the gunboat *Dubuque,* Commander T. L. Johnson, a vessel much too small for the North Sea operation, constituted the original mine squadron under my command.

We had been developing and training in the art of mine-laying for over two years and were prepared to undertake any operation of the kind. As if in anticipation of this very war operation, we had planted a three-line mine field just below Sandy Hook one fine day in December, 1916—200 loaded mines. We did not tell the press about it, as it might have caused anxiety, and we took them all up next day.

TAKING ABOARD A CARGO OF CANNED VOLCANOES

The flotilla of American warships which laid the North Sea mine barrage was appropriately called the "Suicide Squadron."

This and other appropriate exercises, together with many and varied tasks and experiments given us to do, produced a set of working principles, a well-seasoned skill, a self-reliant spirit, and a united, resolute confidence, all based on actual accomplishment, which made this small mine force an invaluable nucleus for the project in hand. It was the more valuable because a substitute was nowhere else obtainable.

The Allies had done considerable mine-laying, but not on the scale nor in such a way as to be of much use as a guide in the gigantic operation ahead. In fact, when the *Baltimore* was sent over, early in March, 1918, in advance of the others, in response to an urgent request for a vessel to help lay a field of British mines in the North Irish Channel, she was ready to do it immediately on arrival, and as soon as the mines were received she proceeded to lay the whole field alone, without any assistance or preliminary trials.

This was a good sample of our quality, which strengthened the confidence of our British colleagues.

The great task of the whole preparation was to expand this small force into

THE GRAND FLEET AND ITS FLOTILLA OF PROTECTING DESTROYERS IN SCAPA FLOW

This magnificent harbor in the Orkney Islands was one of the headquarters of the British home fleet before as well as during the war.

a large squadron equally capable. No matter how superior and numerous our mines might be, the success of the barrier depended on its being properly planted.

NO TIME TO WASTE

There was no time to waste. Eight merchant ships of suitable size, speed, and condition were soon taken over; a special training camp for their officers and men was established under the direction of the *San Francisco,* and the *Baltimore* took up experimenting with various features of the new mine.

The captains and officers of the new ships were ordered in connection with converting them, taking some of the *Dubuque's* officers, since she would not be employed.

Commander Johnson was sent over to London at the same time with Captain Murfin, with a long memorandum of information to bring back as soon as he could—everything we could think of as useful to know about the preparations and local conditions at the base from which we were to work.

One most important step for early settlement was to provide elevators in the new ships. In a ship about 400 feet long, the size of ours, about four-fifths the length is available for installing mine tracks. Four such tracks on one deck hold about 350 mines, and, using two or more decks for mines, the total load could be increased accordingly (see page 105).

Four new ships could thus carry 860 mines each, two of them 610, and the remaining two 350 each. With 350 more in the *San Francisco* and *Baltimore,* we would have a total of 5,700, giving a reasonable margin over the requisite 5,000, for contingencies.

If all the mines in a ship could be raised to the launching deck rapidly enough for all to be planted in a continuous string, it would result in a great saving of time and great saving of space in the mine-field area, besides making better mine fields than if the mines were laid one deck-load at a time, in comparatively short strings.

The British had tried elevators, but with little satisfaction. For our ships, Naval Constructor Beuret called in the Otis Elevator Company's representatives

NINE OF THE TEN SHIPS WHICH COMPRISED THE AMERICAN SQUADRON OUTWARD BOUND ON A MINE-LAYING EXCURSION

WATCH AND WARD FROM THE SKIES

While laying the North Sea mine barrage, the American warships were in constant danger of attack from the submarines, whose death traps were being set. To give warning of such attacks, dirigibles hovered guard over the fleet.

THE AMERICAN MINING SQUADRON IN FORMATION OF LINE ABREAST PLANTING MINES (SEE PAGE 107)

Note the elaborate design of the camouflage, used not with the idea of concealing the ships from the enemy, but to deceive as to the ships' heading. These vessels, while their primary object was mine-laying, at the same time were dangled as an enticing bait before the eyes of the German High Seas Fleet in an effort to make it sally forth beyond the protection of the guns of the Helgoland fortifications.

the very first day, and we thrashed it out together. The result was an excellent installation of six elevators in each of the largest ships; four elevators in the two next largest.

One of the Otis Company inspectors was enrolled as a reservist for the squadron to assist in the installation, care, and operation of the elevators. These installations proved entirely satisfactory. Out of the 32 elevators, only one failed—just once during the whole period of service.

Like all other work during that winter, ours suffered from the abnormal fuel, traffic, labor, and weather conditions. There were many vexations, but by doing all possible to anticipate and avert delays we managed to get five ships completed, making in all 4,000 mines capacity, early in April.

I left Washington then and took command of the mine squadron again, on board the *San Francisco* at Hampton Roads, and on April 12 the *Roanoke*, Captain Stearns, and *Housatonic*, Captain Greenslade, the first of the new vessels, joined the flag—an event long worked for.

No account of an accomplishment so extraordinary should omit to name our full squadron, all names familiar in the old Navy:

San Francisco, flagship, Captain H. V. Butler.

Aroostook, Captain J. Harvey Tomb.

Baltimore, Captain A. W. Marshall.

Canandaigua, Commander W. H. Reynolds.

Canonicus, Captain T. L. Johnson.

Housatonic, Captain J. W. Greenslade.

Quinnebaug, Commander D. Pratt Mannix.

Roanoke, Captain C. D. Stearns.

Saranac, Captain Sinclair Gannon.

Shawmut, Captain W. T. Cluverius.

A VIEW OF THE STERN OF THE U. S. S. "BALTIMORE," SHOWING MUCH OF THE PARAPHERNALIA WITH WHICH A MINE-LAYER IS EQUIPPED

The four placarded affairs are marking buoys ready to be dropped overboard. Smoke-making apparatus, depth-charges, and a towing-spar are also within the camera's vision.

The ships' complements totaled 4,000 officers and men.

THE START IN SECRECY

We may pass over, lightly enough now, the trials and vexations of the next four weeks, viz., breakdowns, losing anchors, fogs, elusive stores, men coming without pay accounts, and accounts coming without the men. It all wound up in four crowded days at Newport, taking final coal, water, stores, and 500 men for the mine depots.

We would have been justified in staying another week or two, our training together had been so meager, but the sense of urgency was strong and none of us felt like waiting longer.

At midnight Saturday, May 11, in all secrecy, without signals or lights, the squadron got under way for Scotland. Leaving harbor, the *San Francisco* was closely followed by the *Quinnebaug,* but off Brentons Reef we waited for the others—and waited. Presently they all appeared, and we were off—only 17 minutes late, after all.

Never shall I forget the blessed peace of the next forenoon, that quiet Sunday of smooth sea and steady, uneventful steaming, headed at last toward our goal.

The peace and quiet did not continue long. Soon after lunch fog shut in and the ships could be seen no more until next forenoon. It was rather early for such a test, but all ships kept together well and were in good station when the fog lifted. It was just in time, for immediately the *Quinnebaug's* steering gear went wrong and she turned directly across the *Housatonic's* bow, having a narrow escape.

This was the beginning of a series of events which made the two weeks' passage a continuous expectancy. Fortunately, I had kept the *Sonoma,* one of the large mine force tugs, with the squadron; so that when a ship broke down one morning the tug could tow her for a whole day, while the other ships rehearsed for target firing.

The German submarines that arrived on our coast May 25 were on their way over while we were crossing. I had been warned of them, and after the disabled ship was repaired the squadron spent an afternoon in gunnery practice—doing very well, considering our hasty preparation. After that we felt we could give a

A BUOY READY TO BE LOWERED INTO THE SEA TO MARK THE LIMIT OF A MINE FIELD

After each day's work it was necessary to mark the extent of the mine field with buoys. These marks were necessary in order to safeguard the mine-layers from falling victims to their own mines. The rope coiled about the buoy is its anchor line.

good account of any submarines we might meet on the surface.

THE WORST DANGERS—TORPEDOES AND FIRE

The worst dangers were torpedoes and fire. All the ships had loaded mines on board, and as they cruised only 500 yards apart, an explosion in one ship would probably disable, if not wholly destroy, the others, too.

In due course bad weather came. The mine ships stood it well enough, but the big collier *Jason,* in our company, began to charge about and to roll heavily. She was a sister of the ill-fated *Cyclops,* and, with a whole garage-full of automobiles on her after deck, the high wind made it impossible for her to keep on the course, and for twenty hours she was lost to view.

Several days later she disappeared again in a heavy squall. Four days passed without a sign, and we had almost given her up for lost, when at early daylight of the morning of arrival she came lumbering up astern, and had regained her proper station before the time set for rendezvous.

As we approached the meeting point, nothing was to be seen up to 15 minutes before 5 o'clock; then two, three, five destroyers emerged from the haze, and another, and others, gyrating, cutting about, chasing their tails.

They had been stretched on a north and south line to allow for our being out of our reckoning, and we, after 3,600 miles, with not a few vicissitudes on the voyage, had struck the middle of their line, right on the dot.

That was indeed a crowded day, and the waters passed through were the most dangerous of any; yet so great was the sense of relief, due to near approach to destination and to the presence of the destroyer escort, that it seemed like Sunday.

And, considering the utter chaos these ships had been in only two months be-

fore, it will be understood, when each one reported herself fit for immediate service, how deep was the satisfaction and how well the future promised!

Various arrangements now interposed a few days' delay, but by June 3 preparations were going full blast for the first mining excursion.

This term, excursion, was adopted as a cheerful offset to the sense of danger. That there were many risks in our undertaking must have been plain to everybody. One cargo of TNT had been enough to devastate Halifax, and our squadron had ten cargoes. Our course would lie through areas where it was necessary to search for mines constantly, and we would come frequently in the regular thoroughfare for enemy submarines.

Moreover, the area where we were to mine had been publicly notified two months beforehand, to warn neutrals, and it would have been natural enough for the Germans to strew a hundred or so mines there on the chance of blowing us up.

Then it was also expected that when the barrier should begin to bring results the Germans would send out more and more force to break it and incidentally destroy us.

In this way we would serve as bait, eventually to draw out the German fleet. We were to have "a front seat at the second battle of Jutland." And so it was not altogether inappropriate to dub us the "Suicide Squadron."

"STICK TO YOUR JOB AND GO UP WITH IT"

The risks in prospect, however, had been no deterrent in getting officers and men. It was a very popular operation. While the ships were fitting out, a favorite slogan was "Stick to your job and go up with it."

There were countless volunteers, and those who were fortunate enough to belong to the squadron felt themselves objects of envy. They buckled to and did all they could to hasten the shipyard work and their own preparation.

Especially with the *Shawmut*, Captain Cluverius, and *Aroostook*, Captain Harvey Tomb, at Boston, the officers and men made a very substantial contribution

A DEFECTIVE MINE EXPLODING PREMATURELY (SEE PAGE 107)

Note the four dark splotches on the surface of the sea, forming a "dotted line" in the wake of the mine-layer, which is proceeding away from the geyser of spray thrown into the air by the premature explosion. They convey to the reader some idea as to how thickly the North Sea was strewn with explosives.

H. M. S. "VAMPIRE": CAPTAIN GODFREY, R. N., ESCORT LEADER, STARTING A SMOKE SCREEN TO PROTECT THE MINE SQUADRON WHILE RUSHING TOWARD A SUBMARINE DANGER QUARTER AT A SPEED OF THIRTY KNOTS

Two depth-charges were dropped, and "whatever was there, those charges will keep him down for a considerable time," signalled the *Vampire* after the excitement had subsided.

A SUBMARINE ATTACK ON THE MINE SQUADRON: NOTE THE SMOKE SCREEN SPREAD BY THE ESCORTING DESTROYERS AND THE SHIPS FLEEING IN A ZIGZAG COURSE TO ELUDE THE ENEMY

"Just after the soup at dinner, one of the ships of our squadron saw a periscope and let out the warning shrieks" (see text, page 108).

THE SQUADRON COMMANDER AND COMMANDING OFFICERS OF THE U. S. NAVY MINE-PLANTERS

Left to right, standing: Commander Canaga, Aid; Captain Johnson (*Canonicus*); Captain Tomb (*Aroostook*); Captain Greenslade (*Housatonic*); Captain Gannon (*Saranac*); Captain Reynolds (*Canandaigua*); Captain Mannix (*Quinnebaug*). Sitting: Captain Cluverius (*Shawmut*); Captain Stearns (*Roanoke*); Captain Belknap (Squadron Commander); Captain Butler (*San Francisco*); Captain Marshall (*Baltimore*).

A STRING OF MINES ON THE DECK OF THE "SAN FRANCISCO"

A few links in the American-forged chain which strangled the Prussian submarine snakes in their nest. On each mine-laying excursion the American flotilla could carry a cargo of five thousand of these mines (see page 96).

toward hastening the construction, like Perry's men building their own ships to fight and win the battle of Lake Erie. The only thing that really bothered us was any delay in getting to the actual mine-laying.

By June 6 all was ready for the first excursion. As far as could be foreseen, everything had been planned and arranged for. Courses and distances to be steamed were listed, the formations of the ships were prescribed for various times, and a schedule was made for planting mines, accurate to the second.

The instructions were complete as to intentions, yet not so hard and fast as to hinder action in emergency. All the captains had been in conference on board the flagship *San Francisco,* and Captain Godfrey, R. N., commanding H. M. S. *Vampire,* the escort leader, and I had had a conference with Rear Admiral Strauss, U. S. Navy, Commander of the Mine Force.

Departure was to be at midnight, the two detachments to join at Cromarty Buoy at 1 a. m. The move was kept secret, because news could be sent through to the enemy in 18 or 20 hours—time enough for an attack of some kind.

THE HISTORIC DEPARTURE

The eve of departure brings drizzling, misty weather. On board the ships the wise ones try for some advance sleep. Midnight comes, and without signals or lights or any noise but the clanking chain, the flagship gets under way and heads out.

The signal quartermaster reports one ship after another under way and following. Fort George shows the signal for an open gate, and as the second ship passes out through the submarine net they all form column astern and close up to 500 yards apart.

The full number of lookouts are at their stations and warned to be alert, and

PERISCOPE-STALKING: A FAVORITE PASTIME FOR AMERICAN SAILORS ON DUTY IN THE NORTH SEA

Beneath his cold-weather togs and his life-belt jacket, the heart of every man-jack of them is beating with excitement—not from fear, but from the zest of the hunt for the man-made monsters of the deep.

the men are now sent to the battery, making a little stir for the moment. Then quiet falls again. Small patrol craft can be dimly seen here and there on watch against danger for us.

Fifteen minutes more and we see long, low forms slinking against the dark background of North Sutor, at the entrance to Cromarty. These are the destroyers of our escort going out to form a screen.

Close following them we count larger, higher moving shadows—one, two, three, four, five ships—all there! The heads of the two columns now reach the buoy at the same minute and the whole squadron stand on, without pause, together.

Four destroyers are ahead and another group on either side—12 in all. No signals, no lights. So we stand out Moray Firth, through the one-mile-wide channel, which is swept every day for mines.

Toward 8 o'clock we pass Pentland Skerries, near John O'Groat's house, and steer east, and then we see coming out from Scapa Flow four British light cruisers, four battle cruisers, with six destroyers, and last four battleships, with six more destroyers. They edge off to the southward and eastward, fading into the morning haze, to keep between us and possible harm from Germany. It was a force of the same strength that supported our latest excursion in October. On the second excursion, in June, our own battleships, under Rear Admiral Rodman in the *New York*, were the support, making a proud sight for us, as the great squadron filed out and swept off toward an intercepting station.

LAYING THE FIRST MINE

Straight over to Norway we go, making Udsire Light toward midnight; then off to the northwestward. It is a busy night and early morning, keeping the ships in station, going over the mines for final ouches, watching on every hand for enemy submarines, and getting all clear for our first large operation.

A GROUP OF BLUEJACKETS OF THE U. S. S. "BALTIMORE"

The *Baltimore* was sent over seas in advance of the other ships of the mine-laying squadron at the request of the British, to assist in laying a field of British mines in the North Irish Channel. Immediately upon her arrival, the *Baltimore* reported ready for duty, and as soon as the mines were received proceeded to lay the whole field alone.

At 4.27 a. m. the signal is made that mining will begin at one hour later. The crews go to mining stations, and in the flagship we look for signals reporting whether the other ships are ready. They *are* ready, every one. It is like a horse-race when the starter's flag is up. How will it go, after all these months—for some of us years—of preparation?

The squadron stretches a mile and a half in a beautifully straight line abreast. Several destroyers ahead have their sweeps out, to explore for enemy mines in our path (see page 98).

Now the mine-planting signal is flying; they will begin when it starts down. Commander Canaga stands, watch in hand—"two minutes, one minute, thirty seconds more, fifteen"—he looks up inquiringly. All right, "Five seconds—haul down!"

And in answer red flags break out on the other ships, showing that they have begun to plant. On the flagship's bridge the call-bell rings, and from the launching station at the stern the report comes, "First mine over."

All well so far—a good beginning.

Now comes the trying time for the squadron commander—the endless waiting, all alert, for whatever may befall. Nothing to do while all goes well, but instant decision and action in case of mishap.

Hour after hour the mining goes on. The staff officers watch the scheduled events and compare the times with what they should be. A few seconds out here and there; otherwise all goes without a hitch—just as planned before leaving the United States.

Some defective mines explode astern, which is startling at first, then reassuring as to the safety features of the mine. At the same time, one's respect grows for the mine's deadly power (see page 101).

A WORLD RECORD IN MINE-LAYING

Now we watch the *Housatonic*, a new ship, with a new, untried installation, doing a string of 675 mines, one every 11½ seconds throughout two hours and ten minutes Her mate stands by, ready for any interruption; but the *Housatonic*

completes the task without a break—a world record up to that time In a later excursion the *Canonicus* lays 860 mines in 3 hours 35 minutes without a break, making a string longer than from Washington to Baltimore.

At last, after nearly four hours, the schedule is finished. We stand on for a mile and then three ships drop mark-buoys. The line of ships wheels to the right and plants more buoys to pick the field up by when we return to prolong it.

Now the ships reform in four columns and start back to base. Below decks the men are cleaning up, securing the gear, and getting a wash for themselves. That done, they drop in their tracks, dog-tired, and the decks are thick with sleeping forms.

THE CROWDED-HOUR CLUB

We hoped for a quiet afternoon that day, with a few cat-naps, handy to the bridge; but Captain Godfrey had plans for his destroyers which interfered, giving them a smoke-screen exercise about 2 p. m., which sent all of us tumbling up to the guns.

Then an airship claimed attention; one of our own ships had to drop behind to set up on a loose bearing, and a wide-spread smoke appeared, proving to be a convoy of fifty vessels. Finally, just after the soup at dinner, our next astern saw a periscope and let out the warning shrieks.

Our ships turned together, on signal, half right, to steer away from the danger quarter, while the *Vampire* ahead swooped down at 30 knots to drop two depth charges. "Whatever was there," he signaled, "those charges will keep him down for a considerable time." It was then, as we resumed our stone-cold meal, that we changed our name from mining squadron to "Crowded-hour Club."

Through the day reports had been coming in by signal, showing that everywhere all had gone well, without casualty, and that each ship was prepared to undertake another operation upon receiving the mines. Our first excursion was unquestionably a decided success.

There were in all 13 excursions by our squadron and 11 by the British mine-laying squadron. Twice the two squadrons were joined to lay their mines in company. On the first occasion our Rear-Admiral Strauss went out in command of the joint force; the second time Rear-Admiral Clinton-Baker, R. N.

SEVENTY THOUSAND MINES LAID

On one of these joint excursions ten American ships planted 5,520 mines, the four British ships 1,300, making a total of 6,820 planted in four hours. This is the record for number. A few weeks later our squadron alone planted a field 73 miles long, making a record for distance.

The whole barrier contained 70,117 mines, of which 56,571, or four-fifths, were ours. The average was three excursions a month, though the intervals between were irregular. We steamed altogether 8,700 miles in 775 hours while on these excursions.

It might be expected that with so many features alike the excursions would soon have become monotonous, but such was not the case. Each one began, continued, and ended with almost the same zest as the first, and always some unusual event or circumstance brought in new interest.

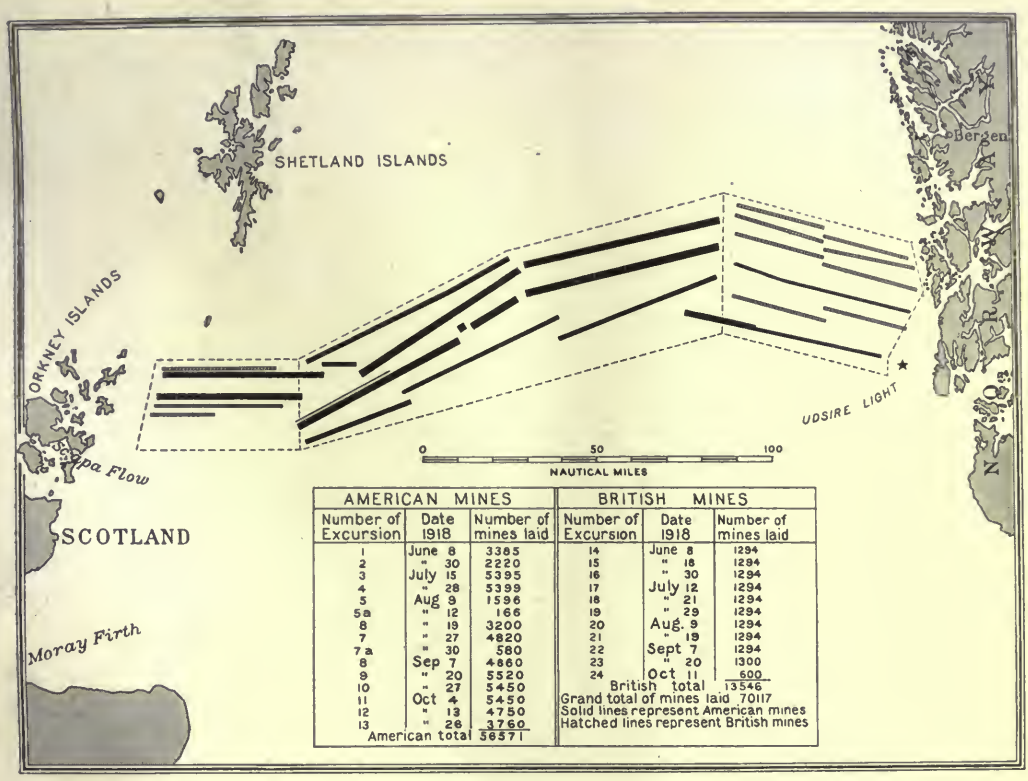
The absolute necessity of *sustained* attention and care in details was well understood by all, so that every one was pretty well keyed up from start to finish. After 48 hours of that, scarcely losing consciousness for a moment, we would get a few hours' sleep—too sodden to be really restful—and then on rising feel an indescribable exaltation.

In this mood I would have the captains and my staff at a conference, followed by a lunch, most memorable and enjoyable mixtures of council table and festal board.

Coöperation with our Allies was mutually all that could be desired, and we formed most agreeable associations. The big squadrons, too, felt much interest in our work and enjoyed being detailed for our support.

PASSING THE GERMAN FLEET

On our way home, after the signing of the Armistice, our squadron passed through Scapa Flow, where the German fleet was interned. As our long column



AMERICAN MINES			BRITISH MINES		
Number of Excursion	Date 1918	Number of mines laid	Number of Excursion	Date 1918	Number of mines laid
1	June 8	3385	14	June 8	1294
2	" 30	2220	15	" 18	1294
3	July 15	5395	16	" 30	1294
4	" 28	5399	17	July 12	1294
5	Aug 9	1596	18	" 21	1294
5a	" 12	166	19	" 29	1294
6	" 19	3200	20	Aug. 9	1294
7	" 27	4820	21	" 19	1294
7a	" 30	580	22	Sept 7	1294
8	Sep 7	4860	23	" 20	1300
9	" 20	5520	24	Oct 11	600
10	" 27	5450	British total		13546
11	Oct 4	5450	Grand total of mines laid 70117		
12	" 13	4750	Solid lines represent American mines		
13	" 28	3760	Hatched lines represent British mines		
American total		56571			

DIAGRAM SHOWING THE OVERLAPPING LINES OF MINES LAID IN THE NORTH SEA

Only by a miracle could a submarine have made its meandering way through such a mine field without encountering disaster (also see map on page 86).

wound in among the heavy British battleships and battle cruisers, their crews were massed on deck, cheering each mine-layer as she passed, our crews running from side to side to make response.

Admiral Madden, of the first battle squadron, signaled his wishes for a speedy return home and his "regret in parting with such a splendid force, such a brave bunch."

Upon nearing the Germans' anchorage our ships kept silent while we steamed by. On some of the German ships scarcely a man was on deck; on others the rails were filled, officers and men mingling together, to gaze on us, who had been their bait. In this way we had almost passed them, without a sound or a sign, when the British trawlers that were holding the nets on the opposite side—had been holding those nets, in fair weather and foul, for four long years—seeing our flag and knowing our work, broke out into loud and long blasts and toots of their steam whistles.

The *San Francisco* answered gravely by the customary three blasts of the whistle, and in succession the following ships did the same; but one of them blew her siren instead of her whistle, and that started them all off again.

Going on further, making toward the entrance, we passed the battle cruiser *Lion,* speeding back and forth like a sentry on post—a ready check on any German ship that might attempt a dash for liberty.

THE END OF THE SUBMARINE—THE END OF THE WAR

A parting message was flashed to us by the *Lion* from Vice-Admiral Pakenham, "You take with you not only my personal regards, but the gratitude and admiration of the battle-cruiser force."

Quite early in the summer, after only

the second excursion, our work began to bring results, and more and more reports came in of submarines damaged or lost in that vicinity, although the British policy of secrecy about submarine losses concealed the definite numbers.

The actual losses will probably never be fully known; but, according to report, the Germans admit the loss of 23 submarines there, and the British Admiralty staff have been quoted as holding that the surrender of the German fleet and the final armistice were caused largely by the failure of the submarine warfare, this failure being admitted as soon as the mine barrage was found to be effective.

Too much cannot be said of the fine spirit of the personnel. Their work was arduous and opportunities for diversion limited, but they made the most of both and backed their work with their money, of the Fourth Liberty Loan staking $5 on each mine in our mine fields. With the mines crowding their quarters so much of the time, the men's living conditions were very uncomfortable, but their baseball league, track athletics, and boat-racing kept them fit and keen, and their relations in the towns were most agreeable. As a visiting naval officer wrote, "The whole Mine Force is short on criticism and complaints, but long on work and results, and the Navy should be intensely proud of them."

How was it possible to navigate safely so many times through infested waters and close to mine fields, to steam so many miles together so steadily, to outdo the telephone in speed of signaling, and to handle and plant 56,000 mines, sometimes continuing through fog or darkness—all without accident?

Logical and thorough preparation, painstaking foresight, admirable coöperation, and able leadership undoubtedly paved the way; but these alone would not have made an achievement so clean. Something more was needed, and that something included two things: first, and all the time, unquenchable optimism, and next, it had been brought home to every individual that his work could be done by only one man in the world!

SARAWAK: THE LAND OF THE WHITE RAJAHS

By Harrison W. Smith

With Photographs by the Author

WITH the recent death of Sir Charles Brooke, G. C. M. G., the second of the white rajahs of Sarawak, there came to an end one of the most useful and unusual careers among the many that have done credit to British rule in the Far East. For nearly 49 years he governed, as absolute sovereign, a mixed population of Chinese, Malays, and numerous pagan tribes scattered through the villages and dense jungles of an extensive territory on the northwest coast of Borneo.

Constant solicitude for the welfare of his people won the sympathy and devotion which enabled this white man, supported by an insignificant army and police, to establish the peaceful occupations of civilization in place of barbarous tyranny and oppression.

Although Sarawak has been visited by a number of celebrated explorers and the general features of the country and its inhabitants are well known, there still remain vast areas of virgin jungle to invite the amateur naturalist, who can hardly fail to add some new specimens to the collections of those who have preceded him.

BIRDS, BEASTS, AND BUTTERFLIES PROTECTED IN SARAWAK

Here are found the argus pheasant, the leaf butterfly, and that most beautiful

NATIVE WOMEN SPRINKLING RICE AND PERFORMING OTHER CEREMONIES IN PREPARATION FOR THE HARVEST FESTIVAL

After setting aside from the rice crop the portion required for the year's food supply and enough more for trading purposes, the remainder is converted into a rice wine, and feasts are held in one house after another. The scattering of rice about the house is supposed to propitiate the evil spirits.

butterfly of all—the Brookeana. This last-named species is comparatively rare, and at one time brought so high a price that it might have become extinct were it not for the fact that the game laws of Sarawak protect even the butterflies. The collector is allowed to take only two specimens of any one kind, whether it be bird, beast, butterfly, or orchid.

Indeed, the Sarawak jungle is better protected than our forests. The jeluton tree yields a valuable gum, but if improperly tapped the tree is easily killed; therefore, inspectors have been appointed to regulate the tapping in order that this natural resource of the country may not be destroyed.

It was not the natural history of the country, however, that prompted the author to visit Sarawak; it was rather the opportunity to become acquainted with primitive and interesting people, still living the simple life of their ancestors in the primeval jungle, unspoiled by contact with the white man.

The author has been the honored guest in the houses of these people; he has received the best they had to offer. They are by no means free from serious faults, but these are disappearing, and they possess many homely virtues.

SEA DAYAKS, EARLY PUPILS OF PIRATICAL MALAYS

The Sea Dayaks, or Ibans, to use the native name, are the largest and most progressive tribe. Their love of adventure made them the ready pupils of the piratical Malays in the early days; but since their initiative has been turned into

SILVER HEAD-DRESS, BELTS OF SILVER COIN, AND NATIVE WOVEN SKIRT CONSTITUTE THE HOLIDAY COSTUME OF DAYAK WOMEN DURING THE HARVEST FESTIVAL SEASON

useful channels, they have shown much capacity for development. They are thrifty and industrious, building good houses, which are usually neat and clean.

As with most of the Sarawak tribes, personal cleanliness is the rule, and the Dayaks have been known to comment on a white traveler to the effect that, although he seemed to be otherwise all right, he did not bathe quite as frequently as they considered necessary. They are a fine race physically and delight in personal adornment, in which they show excellent taste in the use of colors for the *chawat,* or loin cloth, and for the bead necklaces and headdresses.

I had an opportunity of seeing them under the most interesting conditions by visiting at two of their houses on the occasion of the harvest feast. After setting aside from the rice crop the portion they require for the year's food supply and enough more for trading purposes, the remainder is converted into a rice wine and feasts are held at one house after another.

On the morning of the feast chickens are killed, rice is scattered about the house, and other ceremonies are performed to propitiate the evil spirits.

As guests begin to arrive from neighboring houses, the gongs are beaten, small brass cannon are fired, if gunpowder can be obtained from a white visitor, and live fowls, as a token of goodwill and friendship, are waved about over the newly arrived guests.

The sacrifice of fowls plays an important part in many ceremonies, such as that of blood-brotherhood among the Kayans when a man is adopted into the family of another, the killing of the fowl serving as a means of conveying a message to the gods.

THE CEREMONIAL OF THE GREAT FEAST

On the evening of the feast, at one of the Iban houses, I witnessed a rather startling performance of the sacrifice of a fowl.

The great feast of the day was held at noon, and in the evening the different members of the house invited their particular friends to supper in their own

DAYAKS ENTERTAINING VISITORS AT A BANQUET DURING THE HARVEST FESTIVAL

Being a guest in Sarawak is not always an unalloyed joy to one with American tastes. The culinary masterpiece of the occasion is chicken à la Dayak. The fowl's larger feathers are pulled out and some of the remaining ones burned off over a fire. Nearly all that is left is chopped fine and stewed.

DAYAK WOMEN IN HOLIDAY COSTUME FOR THE HARVEST FESTIVAL

The lady with the sunshade and the Seventh Avenue dressing sacque looks as if she might be the duenna for this bevy of native belles. Many semi-civilized tribes wear anklets of brass, silver, and gold, but in Sarawak Dame Fashion seems to have decreed "calflets."

THE SARAWAK VARIANT OF THE AMERICAN INDIAN GIRL'S PESTLE AND MORTAR FOR GRINDING CORN

A girl stands at each end of the trough, giving alternate blows into the depression in the center. Each keeps one foot in the trough and frequently, with a rapid motion, the grain (which is rice in this part of the world) is pushed back to the center.

rooms, my companion and I being entertained in the room of one of the more prosperous members of the community, where we seated ourselves on the floor about a great variety of refreshments served by the daughters of the house.

We had not been long seated when a young man entered, and greeting another guest with good wishes for his health and happiness, held toward him with both hands a young chicken. The other, reciprocating the expressions of friendship,

grasped the head of the chicken, and between them they instantly pulled the neck in two.

As an ethnic curiosity, it would be interesting to inquire whether there is any relation between this custom and that which is practiced at dinner parties in polite society, where bonbons are pulled in two and the contents eagerly examined.

GOOD OMENS READ IN PIGS' LIVERS

At noon the most important event of the feast day takes place—pigs are killed and from their livers omens for the next year are read. During the morning the pigs have been decorated with beads and charms, charged with messages to the gods, and urged to show, by the markings on the under side of the liver, what the future has in store.

After the pigs are killed the livers are extracted and the learned men proceed with their interpretation of the omens.

As there are always enough pigs so that some of them are sure to have livers that give good omens, the feast then begins with great good cheer, the women bringing out delicious new rice—brown in color and nutty in flavor—cooked in neat little individual packages made from leaves; also various excellent vegetables from the jungle, such as the heart of several of the palms as well as the tender shoots of certain ferns, and, finally, slightly roasted pig and partly boiled chicken.

The method of preparing the chicken will indicate that participation in a Dayak feast is something of an ordeal. The larger feathers are pulled out, some of the remainder burned off over a fire, and nearly all that is left is chopped fine and stewed.

COCK-FIGHTING THE CHIEF PASTIME OF THE AFTERNOON

Cock-fighting is the chief event of the afternoon, and on these occasions the birds are armed with sharp knives, so that the fights are usually soon over. The cock-fighting is held outside the house, in the shade of the trees, in which the small boys who climb with hands and feet find an excellent point to view the sport.

Hugh Clifford, who has written most fascinating stories about the Malays, remarks that we must not too strongly condemn cock-fighting while fox-hunting continues to be recognized as legitimate sport. The game-cocks fight because they enjoy it; the fox participates from no desire of his own, and must experience the keenest agony of terror with a pack of howling hounds at his heels.

After the cock-fighting, rice wine begins to flow more freely, and boisterous merriment continues long into the night.

In the years gone by, the evening's entertainment might have ended with the "head dance," with the result that some young warriors would thereby be inspired to set forth in quest of new heads to decorate their homes.

The head dance is now prohibited, but it was demonstrated once for my benefit at the house of a pleasant little chief who wished to do me a special favor.

THE HUNT FOR THE GREAT APE OF BORNEO

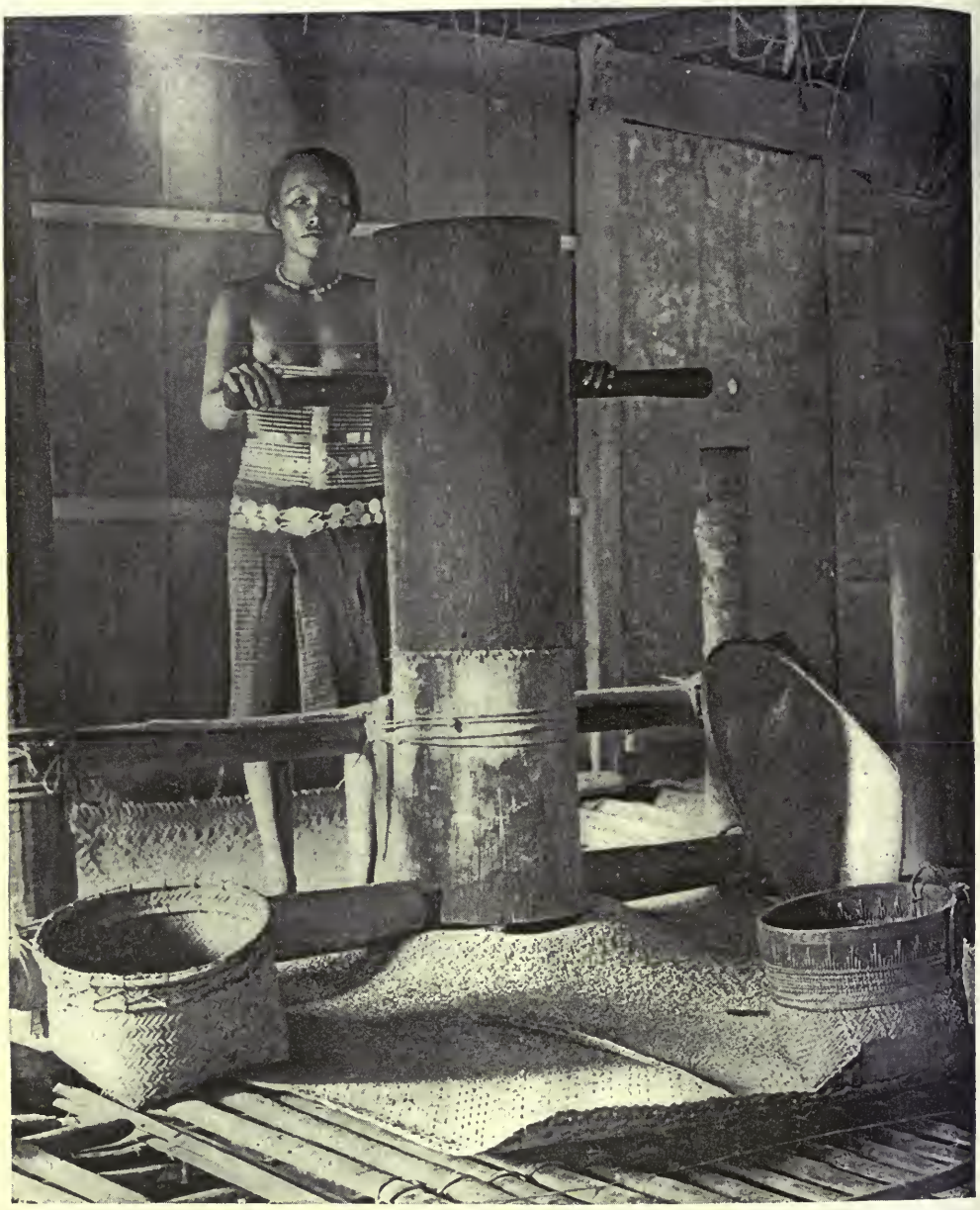
I had been spending several days in a vain endeavor to obtain photographs of the great ape, the *orang-utan*—the Malay name signifying the "Man of the forest"—corrupted into "orang-outang." Finally, my friend the chief assured me that if the young fellows who were going about with me couldn't find the *orang-utan,* he could.

So, one morning, we all set out under his guidance and ended an arduous and fruitless day's tramp by getting lost late in the afternoon in a rattan swamp—a swamp so thick and choked with the sharp tendrils of vines that progress could only be made by cutting a path through the thorns.

Thanks to my compass, we found our way out, but the little chief was doubly chagrined. To make amends, he entreated me so earnestly to accept the hospitality of his house that I could not refuse, although his was not a clean house and I was comfortably established in the shop of a Chinaman.

THE RITUAL OF THE "HEAD DANCE"

After my evening meal, supplemented with several delicious fruits, including the durian, which has so bad an odor that considerable courage is required when one first tastes it, and after all other



A DAYAK WOMAN OPERATING THE RICE-HUSKING MILL

Rice is poured in at the top and works down through the grooves as the upper part of the mill is twisted back and forth.

resources of hospitality had been exhausted, the chief told me he was going to show me the head dance as it used to be done.

Two old women took one of the heads from the cluster hanging in the smoke over the fire. Then they placed some boiled rice between the jaws, with a lighted cigarette in one corner and a quid of betel-nut and siri in the other. The latter is chewed continuously by all people, giving the mouth and teeth a dark, reddish stain. In this way the spirit of the head was propitiated by giving it food, a cigarette, and betel-nut to chew.

The head itself was then carried by the two women up and down the long veranda of the house, swinging it to and

A DAYAK WOMAN WINNOWING THE RICE THAT HAS BEEN HUSKED AT THE MILL SEEN IN THE BACKGROUND

Ordinarily the native women do not wear their silver girdles or brass corsets when engaged in labor of this kind, but pride of appearance before the camera is a feminine trait of universal application. The Dayak girl and the American belle are equally anxious to look their best when posing for the photographer.

DAYAK COCK-FIGHTERS: SARAWAK, BORNEO

Note the elaborate head-dress and the remarkable tail-like decoration worn by the native in the left foreground.

fro in a stiff, awkward dance while they sang a monotonous song, calling upon the spirit of the head to bring blessings on the house. The photograph of the head, which I was able to obtain the following morning, after it had been restored to its place over the fire, shows the rice still within the jaws.

It has not been my experience that Dayaks make such good companions for any length of time as some of the other natives of Sarawak. On the Semundjan River, however, I became well acquainted with a Dayak who had served in the "Rangers," the Rajah's military force, but had resigned, preferring the comforts of his home, cultivating his own rice field and working industriously for his family. He was in all ways very attentive to me, of much assistance in my trips in the jungle, and very grateful for such remedies as I could give the ailing members of his family.

His name was Changkok. He quite liked to be the center of any gathering, doubtless feeling that his knowledge of military affairs gave him a certain position of importance in the community, and he insisted on interrupting the progress of a sword dance one evening to show his skill with an old musket.

He went through the manual of arms, calling out the orders: "Carry, arms"; "Order, arms," etc., but introducing numerous leaps and gestures from native dances, producing a very grotesque effect.

Changkok was immensely pleased with my recognition of the military orders as he rendered them in English, but my host, an old chief, was greatly bored and no little annoyed to witness such perversion of the customs of his people. Finally, Changkok appealed to me to confirm his statement that he was showing his unappreciative friends just how the war dance is really done in Europe.

DAYAK COCK-FIGHTERS: NOTE THE TATTOOING ON THE SHOULDERS OF THE MAN IN THE CENTER

If it is appropriate for the matador to adorn himself in raiment radiant as the sun before entering the bull-ring, why should not the cock-fighter of Sarawak festoon himself with beads, bangles, and bracelets before he tosses his bird into the pit!

The Dayaks live in long communal houses having a common gallery or passageway along one side, with the living rooms on the other. Each family occupies one room.

FINGERS AND TOES INDISPENSABLE IN DAYAK ARITHMETIC

Having occasion to ask Changkok the size of a particular house that I planned to visit, he began counting on the fingers of his right hand, calling off the name of the head of each family. He continued counting on the fingers of his left hand, then on the toes of his right foot, then, beginning on the big toe of his left foot, he paused in thought, holding the second toe. But the effort had been too much; he lost hold of the toe and had to count all over again.

Probably if the problem had required a computation above 20 Changkok, like many other natives, would have had to call in another man with more fingers and toes to count on.

It was an interesting demonstration of the origin of twenty as a unit in our system of enumeration—in English, a score; in French, une vingtaine. If Changkok had employed the fingers and toes of four

IN THE COCK-PIT: SARAWAK, BORNEO

Cock-fighting is the principal diversion among the Sea Dayaks, and, like the Spanish bull-fight, the contest is usually held early in the afternoon.

men he would have counted eighty, or fourscore—in French quatre-vingts, four twenties.

THE LAND DAYAKS

The Land Dayaks, as their name indicates, live inland, and they more frequently build their houses at a distance from the streams than is the habit with other tribes. In addition to the Malays, they are the natives of Sarawak proper—that is, the territory first ruled by Sir James Brooke—constituting the southerly division of the Raj of Sarawak.

They are more affected by contact with foreigners and are rather less enterprising and energetic than their neighbors, the Sea Dayaks, who occupy the Batang Lupar and Rejang rivers to the north. A few Land Dayak villages in the vicinity of the headwaters of the Sarawak and Sadong rivers near the Dutch border remain, however, little affected by foreign influence.

In common with the other tribes of Borneo, their houses are long communal dwellings built on posts 8 or 9 feet from the ground, a passageway on one side giving access to the rooms, each of which is occupied by one family.

The Land Dayaks, unlike the other tribes, also build a square house on very high posts, considerably above the level of the "long house." It is called the "head house" from the fact that in it are kept the heads which they have taken from their enemies (see picture, page 129).

The head house is the general place of meeting; it is there that the Resident on his visits meets the people, and there, also, that unmarried men and boys as well as visitors sleep. It is an interesting experience, when one for the first time lies down to sleep with a great cluster of blackened skulls grinning from the rafters overhead, even when they are very old skulls (see also page 131).

A GROUP ABOUT THE COCKING MAIN: SARAWAK

The man in the central foreground of the picture wears a mat made from a tiger skin; it is ornamental when he is standing and comfortable when he sits down.

Many of the young people of the Land Dayaks are finely developed physically, but the women deform their arms and legs with great coils of heavy brass wire, which must be exceedingly uncomfortable to wear (see pages 113 and 130).

PAIN GLADLY ENDURED FOR FASHION'S SAKE

One evening, in the head house, a girl sitting next to me had a bad sore on her arm caused by the chafing of the wire. To my query if the wire did not hurt, she replied that it did hurt very much; whereupon an old woman observed that the wire was nevertheless very beautiful and very much the fashion, intimating strongly that I might hold my peace and not interfere with matters that did not concern me.

Traveling through the Land Dayak country, as elsewhere, is by means of the rivers and jungle paths. In this district I was fortunate in being able to travel with two of the Residents on the occasion of their official visit, thus enjoying the opportunity of seeing the people at their best.

On our journey to the village of Tmong we found ourselves, as darkness was approaching, at the end of navigation on a little stream, with our destination an hour's walk distant through the jungle in the rain. We could have remained at a near-by village; but as great preparations had been made for our reception, it was decided, in order not to cause disappointment, that we must push on.

The prospect was not pleasant, for in twenty minutes it was impossible to see anything; one could only follow the noise of the man in front. Soon, however, we were met by parties of young men bearing great flaming torches of bamboo, who glided along the path, the red glare of the torches enhancing the physical beauty of smooth, brown skin and fluent muscles.

ONE OF THE SPECTATORS AT A COCK-FIGHT

The small boys climb with hands and feet and do not allow the adult population to interfere with their view of the "great Borneo game."

Sometimes the flaring light would reveal the trunk of a giant of the jungle towering free of branches into the blackness overhead, while all the time the night insects were droning and booming and ticking with the ceaseless clamor of the tropical night.

THE PHONOGRAPH IN SARAWAK

A phonograph that I carried for the purpose of recording native songs was a source of great amusement. Many natives who had traveled to the government stations had heard the ordinary records, but none had ever heard their own language.

It was at times difficult to persuade any one to sing into the rather formidable-looking trumpet, but when a song had been reproduced from a record made at another village there was usually no further difficulty in bringing forward the "artists" of the house. When finally they heard their own voices issuing from the little box, their wonder and amusement knew no bounds. It is a pity no photograph could have been obtained of the bank of faces surrounding our little party, with the phonograph in the center, when they first real-

SARAWAK SOCIETY OCCUPYING A RING-SIDE BOX AT A COCK-FIGHT

The onlookers are grouped on a platform at the end of a Dayak house, which is built high from the ground. The space beneath is utilized as a combination pigsty and chicken run. Note the family dog on the platform.

ized that a box was talking their own language in the voice of one of their own number.

The mechanism of the phonograph was fastened to the under side of the cover of the box that contained it, so that by inverting the cover and fastening it to the box a good stand was provided. One evening, when I had finished and was lifting the cover, an old man touched me on the shoulder, with the remark that he wanted to have a look inside, doubtless thinking that he was going to expose some trick on my part.

Another man, who had frequently been down the river to the government stations and heard ordinary European records, said that there was nothing so very extraordinary in a box that simply talks the language of the white man, but that a box should be able to talk their language was indeed wonderful. On another occasion I heard a young Dayak ask a stranger if he had ever seen the "box that talks." "No," replied the latter, "I'm only an up-river man."

A GENTLE, KINDLY PEOPLE

It is the general testimony of travelers in Sarawak that the Land Dayaks are a gentle, kindly people, easy to get on with, grateful and loyal to their friends. This was certainly my experience with Juni, a Land Dayak boy.

Juni was my cook and personal servant when I went up the Limbang River, and he was tireless in his devotion to my comfort, although, it must be admitted, sometimes a trifle careless; as on one morning when he packed my rice, raisins,

ONE OF THE EXPERTS IN THE SPORT OF COCK-FIGHTING EXAMINING THE LONG KNIVES WITH WHICH THE BIRDS ARE ARMED

When the cocks are so equipped, the fights are of short duration. The native in this photograph is wearing a coat of typical Dayak texture and design.

opened tin of milk, and biscuits in the bottom of an iron pail and then laid the kerosene lantern on top. He was much distressed when he discovered the oily condition of my lunch; but there is a phrase in the Malay language that solves all difficulties, "Apa buleh buat?"—What can one do?

As Juni had worked in the houses of some of the planters near Kuching, where he had learned both good cooking and dainty serving, he supplied my table with such delicacies as fried fish, pheasant stew, and salads of fern sprouts and the hearts of palms, but he did not at all approve of my coarse, agate plates; so, quite unknown to me, he bought a pretty blue China plate in order that the products of his culinary art might be served in a worthy manner.

His good humor was inexhaustible, even under inconsiderate treatment from one or two of my Sea Dayak boys, who, like the Prussians, regarded themselves as belonging to a superior race. The following incident shows that he possessed no small amount of intelligence.

FIGHTING MALARIA AND SMALLPOX

When planning to visit one of the coast stations where malaria happened to be unusually serious, I cautioned my seven native boys that they must all provide themselves with mosquito curtains to sleep under, explaining that it had been discovered that if one were not bitten by a mosquito he would not get fever. After thinking over my statement, Juni called attention to the fact, which I had failed to notice, that while we had been up river only those had had fever who did not have mosquito nets. He assured me solemnly that he thought there was something in what I said.

In this connection the natives' willingness to be vaccinated is worth mentioning. Smallpox epidemics occur frequently

CHANGKOK, SURROUNDED BY THE MEMBERS OF HIS FAMILY: AN INDUSTRIOUS, HOME-LOVING, APPRECIATIVE DAYAK (SEE TEXT, PAGE 118)

On his legs are numbers of fine rings braided from the fiber of the apin palm, much prized for ornamentation. The women's skirts are excellent examples of Dayak weaving. Changkok's head-dress is made of beadwork, decorated with the favorite feathers of the hornbill. Note the large handkerchief in, shall we say, Mrs. Changkok's hand. Among semi-civilized peoples one seldom sees the father of the family with a baby in his arms.

enough for the natives to remember the high mortality of the unvaccinated and the practically complete immunity of the vaccinated. Any one may obtain vaccination free at the government dispensary or on payment of 6 cents at the outstations.

After several years of freedom from the disease, there is some opposition to vaccination, but as soon as deaths from smallpox begin to occur, the natives are very eager for the treatment.

Juni was a useful, agreeable, and trustworthy companion for a journey in the jungle. He had adopted the Malay name of Smail because of his intention to "enter Islam"—that is, to become a Mohammedan—but I prefer to remember him as Juni, a Land Dayak boy who is not likely to be improved by becoming a Mohammedan and trying to become a Malay.

THE KAYANS, A TRIBE OF UNKNOWN ORIGIN

Perhaps the most interesting tribe in Sarawak and one of those least affected by contact with foreigners is the Kayan, which occupies the head-waters of the Baram and Rejang rivers, in the northerly

THE NIPA PALM AND A FLOCK OF "PADI" BIRDS IN THE LOWER REACHES OF THE NIAH RIVER; THIS PALM GROWS ONLY WITHIN REACH OF THE SALT WATER: BORNEO

Roofing material is made from the leaves of this plant; also cigarette wrappers. Sugar is obtained from the sap and salt secured by burning the roots.

part of Sarawak, extending also into Dutch Borneo.

These people for unknown generations have lived almost entirely isolated in the interior of the island. There are many reasons for believing they are of Caucasic origin, having entered Borneo from southeastern Asia, where they received infusion of Mongol blood and separated from people of their own race, who were the progenitors of the present Karen tribes of Lower Burma.

It appears that the Kayans came to Borneo by the way of Tenasserim, the Malay Peninsula, and Sumatra, later penetrating up the rivers of Borneo. One notices the features of some Kayans that very strongly suggest Caucasic origin, this being particularly true of the upper or ruling classes, who would be most likely to preserve their racial stock uncontaminated by mixture with conquered tribes.

Many Kayans have very light skin, particularly those of the interior and those who have been little exposed to the sun. The tribe believes in a large number of deities, with one supreme being at the head, thus resembling the Greek mythology. Many of the details of the methods of taking omens among the Kayans by the flight of birds and the examination of the entrails of animals present extraordinary points of similarity with the Roman methods of taking the auspices.

While the Brunei Sultans held control of the mouths of the Baram and Rejang rivers they were able to exact tribute from the Kayans, who, in turn, terrorized the Dayaks living below them on the Rejang.

These raids against the Rejang Dayaks who had accepted the Rajah's sovereignty at last became so serious that in 1863 the late Rajah conducted a large expedition against the Kayans of the Rejang,

LAND DAYAK WOMEN IN ALL THEIR FINERY AWAITING THE ARRIVAL OF A GOVERNMENT PARTY

Many of the young people of this tribe are finely developed physically. The discomfort which the women endure by confining their arms, legs, and waists with great coils of heavy brass wire is the price which Sarawak femininity uncomplainingly pays to be in style.

and subdued them. In 1882 the Baram River was ceded to Sarawak, and thus the remaining Kayans came under the control of the government.

Next to the Rejang, the Baram is the largest river in Sarawak, but, unfortunately, it has a shoal bar at its mouth, exposed to the monsoon, which makes it unsuitable for schooners and open only to steamers of light draft. Two such steamers now carry on trade with Claudetown—or Merudi, the native name—about 60 miles above the mouth.

THRILLING PRACTICES OF NATIVE NAVIGATORS

Entering the Baram, especially during the bad weather of the monsoon, is an experience not always entirely devoid of excitement. It is not unusual for the little steamer to run aground on the bar and be washed over by successive waves into deep water on the other side—a method of navigation that does not appear to disturb the Malay pilots in the least.

Along the lower reaches of the Baram, as far as the sea water is carried by the flood tide, the nipa palm, interspersed with mangrove swamps, forms a monotonous and almost continuous wall on each muddy bank. For miles scarcely a tree rises above the high tops of the palms to break the monotony of the swampy, alluvial plain through which the river winds.

Before Claudetown is reached the nipa palm gives place to great jungle trees, the banks of the river are higher, and houses of Malays and Dayaks begin to appear.

Occasionally one passes the ruins of abandoned houses, whose former occupants have moved away in the search of

SARAWAK'S IDEA OF AN APARTMENT HOTEL: THE INTERIOR ARRANGEMENT OF A KAYAN HOUSE IN THE VILLAGE OF LONG PALEI

The floor is of hewn board. Near the middle is a rattan mat with a pile of rice to be winnowed, the rice having been previously pounded in one of the mortars along the wall. The rooms (one for each family) are entered by the doors on the right. The raised platform at the left is

THE OPEN GALLERY IN FRONT OF A LAND DAYAK "LONG HOUSE": SARAWAK.

The platform is eight or nine feet from the ground. The higher building at the left is the "head-house," where heads captured from their enemies are kept, where, also, unmarried men and boys as well as visitors sleep and are entertained. To the clusters of poles at the right, which mark the entrances to the rooms, each of which is occupied by one family, are attached charms to protect the inmates from disease and evil spirits.

new farming lands. These ruins are almost invariably covered with vines, which conceal everything as if a great blanket of vegetation had been loosely flung over roofs and tree-tops.

When the river is in flood, great trees come sweeping down, washed away as the waters continually change their course, so that the beaches at the estuary are piled with huge logs.

A JOYOUS WELCOME AT LONG PALEI

My first meeting with Kayans was on the occasion of a visit of the Resident of the Baram district to the village of Long Palei, about 130 miles from the mouth of the Baram River and about 70 miles from the government station at Claudetown. For this distance the river is navigable for steam launches, but a short distance above the rapids begin and native dugout canoes make slow progress paddling in the rapid current or poling and dragging up the rapids.

We spent two days making the journey from Claudetown, calling at villages on the way, and arriving at our destination, Long Palei, late in the afternoon, where we had no sooner anchored than many of the leading people of the house, including the young chief, came on board to welcome the Resident, who had been absent from his district for several months.

The unfeigned joy with which these people welcomed the return of their white ruler, whom they had learned by long association to recognize as their best friend, was a tribute of which any man could be proud.

When, after the hearty exchange of greetings on board the launch, we went on shore and climbed the steps leading into the long gallery of the house, a very old man came forward and, grasping the

THE SHEATH GOWN IN ITS PRISTINE LOVELINESS

Western civilization has borrowed the slit skirt from the Kayan modistes, but the elongated ear lobes loaded with miniature quoits have yet to make their appearance on the Champs Elysees, in Piccadilly Circus, and on Fifth Avenue (see page 143).

THE GALLERY OF A KAYAN HOUSE DURING A CONFERENCE WITH GOVERNMENT OFFICIALS. NOTE THE ROW OF SKULLS HANGING FROM THE BEAM IN THE LEFT FOREGROUND, NEAR THE TOP: SARAWAK

The formal welcome to visitors in a Kayan house is apt to be long and somewhat tedious, but the ceremony has one advantage over the customs of occidental civilization—when the guest's health is drunk the guest gets the drink (see page 133).

Resident by the arm, conducted him to the seat prepared for him in the middle of the gallery. Then the old chieftainess, Ulau, came forward to greet us.

A STATELY CHIEFTAINESS

The dignified presence and stateliness of the old lady gave me one of the greatest surprises I ever experienced. She maintains rigid discipline, which is characteristic of the Kayan household, from the chief of the house to the head of the family, and the fruits of discipline are apparent in the good manners and recognition of authority that, more than anything else, astonish the visitor, who is not

ALL TATTOOED UP AND NO PLACE TO GO

This Dayak dandy wears on each leg five silver rings and many small rings braided from the fiber of an indigenous palm; he has a fine bead necklace with silver buttons; his head is crowned with an elaborate millinery creation, in which is thrust a hornbill feather. Silver bracelets and a parang, or short sword, with a beautifully carved handle, complete his resplendent regalia.

WATER GIRLS OF DAYAK LAND

These demure Rebekahs of Sarawak are provided with gourds instead of pitchers of pottery, and their well is a bamboo trough fed by the waters of a near-by spring.

prepared to find such culture among Bornean "savages."

There are three fairly well-defined social classes in the Kayan house: the upper class, comprising the chief and his relatives, occupy rooms in the middle of the long house; the middle class, whose members are not related to the chief, occupy rooms on both sides adjoining, while the rooms at each end of the house are occupied by the slaves—that is, the descendants of those captured in war.

"Slave" is rather a misleading term, for in all that concerns the welfare and comfort of this third class they differ so little from the other inhabitants of the house that one without experience has difficulty in distinguishing them. Their daily occupations do not differ very materially from those of the upper classes, for almost all participate in the hard labor of planting and harvesting the rice crops.

The formal welcome to visitors in a Kayan house is apt to be rather long and tedious, but on this occasion a number of deaths had placed the house in mourning, so that our welcome was concluded with the drinking song, a unique and interesting performance.

HOW A GUEST IS RECEIVED IN A KAYAN HOUSE

After the guest is seated on the fresh rattan mats spread upon the floor, when the first greetings have been exchanged and the people of the house have assembled, squatting in a circle around the guest, the young girls bring jars of rice wine and cups, and one of the prominent men of the house, taking his place on the mat in front of the guest, fills a cup and begins the song.

In a monotone, the singer voices his esteem for the visitor and his good wishes for health and prosperity, pausing fre-

KAYAN WOMEN AND GIRLS OF TAMA APING BULIENG'S HOUSE ON THE UPPER TINJAR RIVER: SARAWAK, BORNEO

Obesity is a badge of feminine beauty in Turkey, small feet in China, and large ears among the women of Sarawak. Some of these youthful Borneo belles have suffered a permanent blemish to their charms by trying to grow beautiful in a hurry; their ears have been broken in the attempt to stretch the lobes rapidly by attaching weights greater than human flesh could bear.

quently to recover breath and ideas. At each pause the crowd drones out a chorus, "Ara Wi Wi Ara," and when the singer finally has exhausted his resources in complimentary phrases, he raises the cup to the lips of the guest, who drinks, while the crowd joins in a prolonged shout until the last drop is drained.

This ceremony possesses an advantage over our method of drinking a health in that among the Kayans the guest gets the drink. On certain occasions it is proper etiquette to spill a few drops of the rice wine over the rail of the gallery for the benefit of any spirits that may be lurking outside.

After the drinking song had ended the welcoming of our party, the talk turned upon the news of the country, the gossip of the household, and the disputes that had arisen among themselves or with neighboring houses since the Resident's previous visit.

Throughout the evening and well into the early hours of the morning, the Resident sat patiently listening to the troubles of his people, counseling and encouraging them and rendering his decisions in cases that were brought before him.

As I understood none of the Kayan language, I was glad to be excused and return to the launch, where I had been sleeping comfortably on the deck in the cool, tropical night for several hours before the Resident could leave the almost endless talk of his Kayan friends.

THE SOCIAL HOUR AT BARAM

The Residency at Baram is pleasantly situated on a grassy knoll overlooking the river, where about sunset we were wont to sit in the cool evening breeze, while the

CHILDREN INSURE DOMESTIC HAPPINESS IN SARAWAK

Many of the young girls of the Kayan tribe have their legs tattooed in a fine and intricate design, which, at a distance, strikingly resembles lace stockings. Although the Kayans are skillful in this art, the flesh frequently becomes badly swollen.

Resident received pleasant social visits from natives, some bringing news from up river; others calling for mere friendly gossip.

This was one of the most delightful hours of the day. There was the beautiful expanse of jungle and river glowing in the colors of the brief tropical sunset, with sometimes a native boat or raft of rattan drifting gently down to the Chinese shops or bazaar; the short silence that comes at dusk, when the birds and insects of the day cease their chirping and those of the night have not yet begun—all these things bringing a sense of peace that made the great world seem indeed very far away.

It was on such an evening, some weeks after the visit to Long Palei, that Tama Tijan, the young chief, and a number of his men came to visit, giving me the opportunity of returning their hospitality. They sang for my phonograph, and Tama Tijan, who is a good musician, played the *keluri*, a reed instrument fashioned from bamboo pipes set into a large gourd, resembling somewhat the bagpipe, but softer and more melodious (see p. 146).

One of the men gave the war dance, in which the dancer, springing lightly from side to side, guarding himself with a shield covered with tufts of hair, and brandishing his *parang*, or short Kayan sword, exhibits the skill with which he parries the thrusts of his enemy, and finally overcomes him and takes his head.

GIVING THE "AMERICAN WAR DANCE" BY NATIVE REQUEST

It was all very interesting until Tama Julan, a jolly old fellow, made the embarrassing suggestion that, as they had been showing me how the war dance was done in Borneo, it was only fair that I should show how it was done in America.

Instead of explaining, as I ought to

TAMA APING BULIENG, THE KAYAN HEAD CHIEF OF THE TINJAR RIVER, ARRIVING AT A GOVERNMENT STATION

have done, that we have no war dance in America, I was so foolish as to attempt, with a *parang* and shield, to imitate the war dance of our Indians. My determination to make up in energy what I lacked in grace only added to the absurdity of my performance, and I finished in that distressing silence which falls on a company when something unpleasant has happened.

For a moment no one could think of anything to say; but Tama Julan was equal to the occasion, exclaiming presently in Malay, with great apparent earnestness: "Well! if a man were to meet you in the jungle, he would run right away."

Mark Twain once remarked that the happy phrasing of a compliment is one of the rarest of human gifts and the happy delivery of it another, so I think Tama Julan had good cause for being very much annoyed when a young fellow spoiled his tactful compliment by pointing out that, nevertheless, while I was dancing I was all the time holding the *parang* with the cutting edge toward myself.

Tama Julan's desire to relieve me of the embarrassment of my indiscretion is typical of the Kayan's courtesy and consideration.

A COMPANIONABLE KAYAN BOY

When we returned from our visit to Long Palei, the Resident induced a 17-year-old Kayan boy, Kebing, who had not been well, to come down the river in the hope that medicine and a change would benefit him. For several weeks he was my constant companion, occupying with his little slave the room next to mine in the Residency, where he spread his mat on the floor to sleep.

Kebing is the stepson of Ulau, the chieftess of Long Palei, and the son of

ON THE BANKS OF THE BARAM, NEAR LONG PALEI: SARAWAK, BORNEO

The disk-shaped article which the youth holds in his right hand with his two spears is not a shield but a sun hat similar to the one on his head. His clothing is scarcely of such quality and quantity as would justify the precaution of carrying for its protection the roll of rain-proof *kadjang,* made of palm leaves, which he has under his left arm.

a celebrated chief of former days. He has always been a great favorite with his stepmother, who has trained him so well that few boys could surpass him in gentle manners.

He was for me a constant joy, always keen to see the curious articles in my baggage but never obtrusive; always glad to hear my stories of my country or to tell me about his own. He speaks fluently two languages besides his own, and aided me much in acquiring a knowledge of Malay.

A Dayak less considerate than Kebing once took delight in pointing out to me, while I was floundering about in very bad Malay, that, of course, it's easy for the white man to learn a language, because he doesn't have to trust entirely to his memory; when he hears a word he can write it down.

The mystery of writing is naturally looked upon by the less intelligent up-river natives as a very wonderful thing, and a *surat,* or document, either written or printed, is an object of very great respect. Major J. C. Moulton gives a curious example. He had been traveling with an intelligent native named Belulok when the following incident occurred:

"Belulok asked my assistance in recovering a debt of one buffalo and a quantity of rubber from a Kalabit here, who, he said, had been owing him that for some time.

"Of course, I had no power to do anything of the sort and told him so; but he said he quite understood that and all he

KAYAN NATIVES IN A CANOE WITH A CURIOUS CROCODILE FIGUREHEAD

Aside from some poisonous snakes, the crocodile is the only dangerous living thing of jungle or stream which the natives of Sarawak have to fear, except enemies of their own kind.

wanted was an all-powerful *surat*—it didn't matter what—any scrap of paper with some writing on would do, he said, as the Kalabit could not read (nor could he, for the matter of that). So I gave him an old envelope which bore my name and address, and with this talisman he succeeded in recovering a certain amount of rubber ($10 or $15 worth) there and then! What wicked untruths he saw fit to tell about the power of the *surat* I did inquire about."

Kebing was greatly interested in my sextant, and my attempts to explain the use of it led to many interesting talks. It is always a matter of interest to ask how far it is to the Tuan's "long house," *Tuan* being the Malay title of address for the white man, and the native conceives of the white man living on the banks of rivers in long communal houses, just as he does.

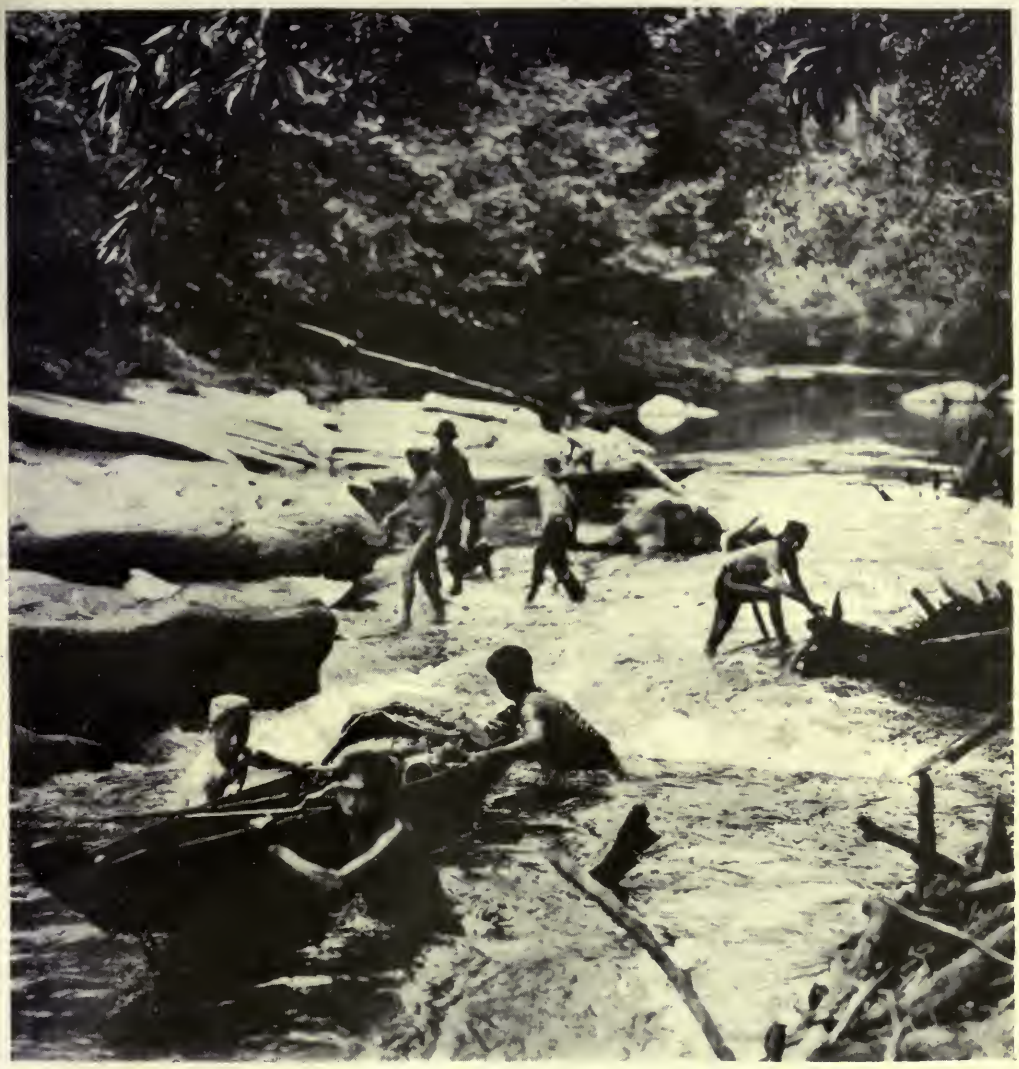
TRYING TO TEACH GEOGRAPHY TO A NATIVE

In an effort to give Kebing some idea of geography, I told him it was possible to go to America by traveling either in the direction in which the sun rises or the direction in which it sets, and to explain this incredible statement I scratched a map on the surface of a green orange, telling him that the sun stands still and the earth turns around.

"Once every day?" he asked.

"Yes," I replied.

"Well, why does it turn?" A rather difficult question.



RAILWAYS AND DIRT ROADS ARE EQUALLY UNKNOWN IN THE JUNGLES OF SARAWAK: THE RIVERS ARE THE SOLE ARTERIES OF COMMERCE AND COMMUNICATION

Next to the Rejang, the Baram is the largest river in Sarawak. When the river is in flood, great trees come sweeping down, washed away as the waters continually change their course, so that the beaches at the estuary are piled with huge logs.

A former Resident once told Tama Bulan, a very intelligent chief, that the earth turns, but Tama Bulan protested that it could hardly be so, for one could see that it is the sun which moves; and the matter was not referred to again for several years, when Tama Bulan one day remarked that he had decided to accept the statement, for every white man he had asked said the same thing.

One evening, when I was taking sights on the stars, Kebing told me the names of the constellations, the Pleiades is "the bamboo clump" and Orion "the pig trap," which it certainly resembles as much as it does a sword, the pig trap being simply a sharp bamboo spike which is driven into the pig and sometimes, unfortunately, into the man who walks against the slender vine that releases the spring.

A KAYAN MORTUARY. THE BODY IS PLACED IN A COFFIN, WHICH IS THEN ELABORATELY DECORATED AND PLACED ON TOP OF HUGE, GROTESQUELY CARVED POSTS

The white rajahs have wisely recognized the danger of destroying the primitive customs and harmless occupations of the pagan peoples of Sarawak (see text, page 147).

PUNANS, ONE OF THE MOST PRIMITIVE RACES OF BORNEO, COOKING A PIG THEY HAD FOUND DEAD IN THE RIVER

It had apparently been dead three or four days at least. What they could not eat they hung by the river for their friends to find. The wind being right, it couldn't possibly have been overlooked.

Since the seasons so near the equator are not at all sharply distinguished by changes in the weather, it is necessary to make use of some astronomical means of determining the proper time for planting rice, for it must be growing during the rainy season.

THE STARS GUIDE NATIVES IN PLANTING

Some tribes make the determination by noting the day when the Pleiades is first visible just before the sun rises. Among other tribes the wise men make what amounts to an altitude measurement of the sun at noon. Two poles, decorated with carvings, are used; one is erected vertically in level ground; the other is used to measure the length of the shadow of the vertical pole at noon; when this shadow has attained a certain length, the proper time has come.

Still other tribes fix the day by the altitude of a particular star or constellation when it can first be seen after sunset; this altitude is indicated by filling a bamboo pipe with water, pointing it at the star, and observing the new level of the water when the bamboo is again held vertical.

Kebing once asked me what the sky is made of—if of rock—and was much disgusted with my rather inaccurate reply, that it wasn't anything. "But you can see there is something there."

One of the difficulties of the Resident is to keep familiar with the names of his Kayan people, for their names are always changing. For example, if Kebing marries and has a son whose name is Soring, his own name will become Tama Soring Kebing—"Tama" meaning "father of"—and he will be referred to frequently by the abbreviated title Tama Soring. If Kebing's wife dies, he will be known as Aban Kebing; if his first child dies, Oyong Kebing, and so on, with several other possible titles. He will end as Laki Kebing, grandfather Kebing. The difficulty is, that it is an important matter of etiquette always to address a man by his proper title.

THE EXCURSION TO MT. MULU

About 35 miles to the east of Claudetown the peak of Mt. Mulu, 9,000 feet high, lying between the basins of the Limbang and Baram rivers, can be seen on a clear day. On the sides of the mountain rise the sources of the Milanau River, which empties into the Tutau River, and thence into the Baram, and furnishes a means of approach to the mountain.

The sides of the mountain are formed of precipitous limestone cliffs, while not the least of the difficulties in making an ascent is to persuade any natives to accompany an explorer, for they believe that such places are the abode of the most malignant evil spirits. In 1858 Sir Spencer St. John attempted the ascent, but was prevented by impassable barriers from reaching an altitude of more than 3,500 feet (see pages 150-153).

The country about Mulu is very thinly inhabited and the jungle is old growth, so that it was with keen anticipation that I started one morning early in June for a visit to the headwaters of the Milanau River.

For the first day the Resident placed the launch at my disposal, which made it possible by towing my native boat, or *prau*, to make rapid progress up the Baram and Tutau rivers, spending the night comfortably at the house of a Malay trader.

The trader had fastened some logs together and moored them to the shore, forming a small landing stage with a little shed, where one could bathe without danger from crocodiles.

As the launch swung in toward the landing, the current caught the bow, and for a moment it seemed that we should strike the log with considerable force; whereupon a Malay on the landing cried out, "Don't run into the iceberg." Thus had the story of the *Titanic*, incredible to the tropical people, spread far into Borneo.

The next morning, bidding good-by to my Kayan friends from Long Palei, who were to be taken part of their journey on the launch further up the Baram River, I made an early start in the *prau*, accompanied by my Chinese cook, Ah Jun, two Malays, and three Dayaks to act as my boat crew.

One of my Malays was suffering from *korup*, a horrid skin disease that covers the body with dry, gray scales; he was

LAND DAYAK MEN OF SARAWAK

The bamboo boxes at their belts contain tobacco, matches, and betel-nut and siri to chew. Generally the loose end of the *chawat*, or loin cloth, hangs from the belt, but the young swell with the bead necklace has tucked the corner of his *chawat* into the belt, so as to be dressed a little differently from the others.

also afflicted with badly inflamed eyes, so common among the natives; but for the latter ailment I was fortunately able to give him considerable relief. He was a very good boy, however, anxious to assist me in every way. The younger Dayak, Migi, was a companionable, good-natured little fellow, with velvety brown skin, a laughing face, and handsome boyish figure—a constant stimulus to the good spirits of the party.

Our first day's journey was to have taken us to a Kayan house, but unfortunately the river was in freshet and the current so strong that progress was very slow. We did not reach the house, and one of the Malay boys, Bakut, a Mohammedan, took delight in teasing Migi, who had incautiously remarked early in the afternoon that he had seen an omen bird that assured him we should find the house just around the next turn.

A NIGHT OF DISCOMFORT

As darkness came on and it began to rain, we found ourselves compelled to seek an eddy in the current. Fastening the *prau* to the bank near an old clearing, three of my crew discovered a dilapidated hut, which they patched up for the night, while the remainder slept with me in the boat.

My unhappy Chinaman found a spot on the muddy bank, where, in the rain, with the help of an umbrella, he cooked an excellent supper, while I, under the shelter of the palm-leaf roof of the boat, collected many beautiful moths, attracted by the light of my acetylene lamp. A black, rainy night is the best possible time for the collector, for on a clear night the nocturnal insects seem to fly high.

Besides the moths, a swarm of tiny flies gathered in front of my lamp as dense as a little cloud of smoke, but fortunately mosquitoes and that worst-of-all

pests, the sand-fly, like our minges, were lacking.

It rained all night, the river rising about three feet; but the dawn came clear, enabling us to get breakfast and proceed in comfort. Less than an hour's paddling brought us to the large Kayan house of Tama Ding—a quiet, pleasant old man, who, I was sorry to learn, died a few months after my visit.

MINISTERING TO TATTOO VICTIMS

I found several people ill of fever, doubtless following the end of the rainy season, and I dispensed quantities of quinine pills, of which one must always take a large supply for the natives.

Many of the young girls had recently had their legs tattooed in a fine lace design, which gives the appearance at a distance of dark stockings; the Kayans are skillful in this art, but the flesh had swollen and my store of vaseline was much in demand.

MIGI, A HANDSOME DAYAK YOUTH, WHO WAS ONE OF THE PARTY OF SEVEN ON THE TRIP TO MT. MULU

"Migi was a companionable, good-natured little fellow, with velvety brown skin, a laughing face, and boyish figure—a constant stimulus to the good spirits of the party" (see text, page 142).

One girl came to me with an arm badly swollen to the shoulder, clearly the result of infection. To my question if she had cut her finger, she first denied it, thinking it not worth mentioning, but finally acknowledged that she had done so, when I asked the reason for the piece of rag tied about it. She showed great amazement at my unaccountable knowledge, when I remarked that she had probably been cleaning a fish when she cut her finger.

As there was nothing, of course, that I could do, I contented myself with putting a little vaseline on the tiny cut, expressing the belief that the arm would probably be well in ten days or so. It was a very safe guess, for it is surprising from what wounds and infections these people can recover with no treatment whatever, while, on the other hand, a white man will find that insect bites and cuts become infected and make bad sores unless antiseptic precautions are continually employed.

When, a week later, I called at Tama Ding's house on my way down river, I

A TYPE OF RIVER CRAFT MUCH USED IN SARAWAK: THE MEMBERS OF THE CREW SQUAT IN THE BOW AND STERN, REACHING OVER THE SIDE TO PADDLE

The roof, made of palm leaves, provides protection from rain and sun. A small dugout is fastened with rattan beside the log.

found that the girl's arm was nearly well, and that I had a reputation as the greatest Manang, or witch doctor, that had ever come up the river.

DISPENSING AMMONIA COCKTAILS TO NATIVE WOMEN

Every one, sick and well, wanted medicine, and when a bevy of cheerful old ladies, with nothing whatever the matter with them, came to me, I was somewhat at a loss. Finding, however, in my splendid little medicine chest an unopened bottle of ammonium bromide tablets, recommended as a nerve sedative, I decided that it was just the thing, and proceeded to administer small ammonia cocktails.

As the old ladies had been chewing the astringent betel-nut and siri all their lives, the pungent flavor of the ammonia gave them a new sensation in their tasteless mouths that pleased them immensely. They crowded around me for more, which I was obliged to refuse.

To one not skilled in the use of medicines, the simplicity of the medicine chest carried by Beccari, the explorer, makes a strong appeal; he dispensed only quinine, chlorodyne, or tincture of Worcestershire sauce, as the symptoms appeared to demand. The native is no homœopath—he wants his medicine strong!

THE BLACKSMITH WORKS IN SECRET

As I came away from Tama Ding's house, I noticed in a shed a man forging a *parang* blade and two others vigorously working a simple pump, made from large bamboos, for blowing the fire. With much interest in the making of these really fine blades, I started to enter, but was quickly told that I musn't do so, but could watch from the outside.

The blacksmith's objections were prob-

A MALAY DWELLING ON THE SARAWAK RIVER: KUCHING, BORNEO

In the water the owner has built a pen of small poles in front of the steps from his house, so that his family may bathe without danger from crocodiles. When floating quietly in a small canoe, men have been known to be taken from it by a crocodile. Recently a little Malay girl rescued her brother by diving into the water and pressing her thumbs into the crocodile's eyes until the boy was released.

ably based on his fear that the arrival of a stranger at the critical moment would interfere with tempering the steel.

In the old days Kayans used to smelt iron and make their own steel, but now they buy European steel bars from the Chinese traders.

Leaving Tama Ding's house at noon, I arrived about 4 o'clock at the small house of Tama Tapan Semanæ, a Kayan, who, having been to a mission school, reads Malay in both Roman and Arabic characters and is an agreeable host, but a generally disreputable member of Kayan society.

As the river was rising rapidly and rain threatening, I was glad to make sure of a dry house for myself and boys rather than risk another uncomfortable night in the *prau*.

Three hours' paddling against a strong current brought us on the following morning to the farm house of Tama Saging. It was a small house built a few miles up river from his fine, large, permanent home for the purpose of working new farm lands.

To Tama Saging I brought a letter from the Resident, asking his assistance and, if possible, his own company for my trip further up river. Tama Saging himself cannot read, but a Malay living with him interpreted the letter, which also called upon him to appear at the government office on business twenty days from the date of the letter.

A KNOTTED STRING HIS ONLY CALENDAR

In order to fix the date, I carried with the letter to Tama Saging a *tebuku*—that is, a string with twenty knots tied in it. While I had the tebuku I cut off one knot each morning, and Tama Saging later did the same, so that when all the knots were gone he would know the appointed day had arrived.

THE KAYAN SWORD DANCE, SHOWING HOW THE WARRIOR ATTACKS HIS ENEMY AND FINALLY TAKES HIS HEAD

The man at the left is playing the *keluri,* a reed instrument of bamboo tubes, giving rather pleasant music (see page 135).

I noticed that Tama Saging had five other tebukus hanging from the bamboo box containing his tobacco.

Before I left Claudetown, word had been received from up the Baram River that the taking of omens for the planting of the rice fields was about to begin, and that in consequence the houses would be *malan,* or tabu, which meant that no stranger could enter them nor the occupants start on a journey during the next three or four weeks, while the ceremonies were in progress.

The Resident cautioned me to ascertain carefully before entering Tama Saging's house if such were the condition of affairs with him, for in that case I would have to content myself with the hospitality of a Chinese trader.

Upon explaining the situation to Tama Saging, he exclaimed that his people were not like those in other communities. He would only take two or three days for observing the omens and would not begin for ten days yet, anyway; so I was quite at liberty to enter his house, where he saw that I was comfortably settled, with my numerous impedimenta, in the veranda or gallery opposite his room.

Visitors are always quartered in the gallery, which forms, on the river side of the long house, a common passageway for entrance to the row of rooms on the other side. As the eaves are low, the gallery is well protected from the rain and is really the best place to sleep.

Tama Saging's hospitality was perfect; but he took his time to decide whether he could go up river with me, and I suspect that he wanted at least to make sure that I would not prove a burdensome traveling companion.

This precaution of finding out if Tama Saging's house were tabu before entering it, provided an interesting illustration of the care that Rajah Brooke has taken

A KAYAN MAN AND WOMAN OF THE TINJAR RIVER DISTRICT: SARAWAK

The lobes of the woman's ears are ornamented with the customary rings, but the upper parts of the man's ears are adorned with much more highly prized decorations—two tiger's teeth, which give him the appearance of having tusks growing out of the sides of his head.

not to interfere with harmless native customs.

WHY NATIVE CUSTOMS AND OCCUPATIONS ARE PRESERVED

It is difficult enough to abolish the harmful ones; and it is best for those people to spend days watching for favorable omens in the flight of birds and the cries of animals, until they have advanced enough to make it certain that a useful occupation can be substituted for that which the superior white man wishes to destroy. Thus the Residents carefully respect this and other *"tabus."*

The danger of destroying the primitive customs and harmless occupations of pagan races simply because the white man knows that he can employ his own time better has been recorded by Stevenson in his pathetic stories of the Marquesans. So many of their customs were

ONE OF THE GREAT LIMESTONE CAVES NEAR THE NIAH RIVER

The mast, supported by shrouds, is erected to give access to the nests of the swift on the under side of the roof of the cave. These edible nests are shipped in large numbers to China. The size of the cave is indicated by the man standing at the right near a shroud.

destroyed that no joy was left in life, and the Marquesans have almost passed away.

In the matter of dress, the early missionaries to the South Seas did great harm by requiring the natives to wear unnecessary clothing, which certainly injured their health and probably their morals as well.

Indeed, it seems very difficult for the white race to believe that modest behavior and morality can exist among people where the body is not wholly covered. Yet Stevenson, writing of the Gilbert Islands, records the strict chastity of the women who "went naked until marriage," and Tylor, in "Primitive Culture," observes that clothes are the cause and not the result of a sense of modesty.

In contrast with the white man's ordinary attitude toward what he pleases to call the "naked savage," it is interesting to note that at the annual field sports conducted for the benefit of the Dayak soldiers at Kuching, Rajah Brooke distributes prizes for the "best dressed Dayak"—that is, the Dayak who is best dressed according to native standards and to as great an extent as possible with the use of native material.

It is well understood that the correct costume for a native upon official occasion is the *chawat,* or loin cloth, and the usual ornaments, unless he be a Malay, when he would wear the more elaborate Malay costume.

For two days I remained waiting at Tama Saging's farm house, for the river continued to rise, rushing past in a muddy torrent. The water was so muddy that a pail dipped full and immediately poured out would retain some of the mud

ONE OF SARAWAK'S LIMESTONE CAVES WHICH IS A FOOD MINE

While some of these caverns yield quantities of birds' nests, highly prized by oriental epicures, many of the recesses remain unexplored, such as the Wind Cave and the Tiger Cave, near the headwaters of the Milanau River.

settled in the bottom; yet, notwithstanding the mud, the water was pure and entirely satisfactory for developing photographs.

THE GOOD OMEN

On the third morning the weather came fine and clear and, although the river was not falling, I got away, accompanied by Tama Saging, eight of his men, and my own crew.

As we pulled away from the landing, a little bird flew singing across the bow, which Tama Saging assured me was a very good omen for our journey.

The flight and calls of certain birds are among the most important signs that the Kayans interpret as prophecy of the success or failure of an undertaking; so that when about to start on a journey it is very annoying to have a large flock of birds whose call is unpropitious make its appearance morning after morning.

In such a case the happy expedient is employed of starting in the dark, before daylight has awakened the birds to their warnings of evil.

At other times, when the cry of a bird of ill omen would be particularly unfortunate, as on the occasion of naming the son of a chief, the difficulty is overcome by beating gongs so loudly that no bird, or indeed any other sound, can be heard!

It was slow work paddling up the river, although we had left behind the large, heavy boat in which I arrived, using one of Tama Saging's that was lighter and better adapted to poling up the rapids.

THE EASTERLY END OF THE MULU RANGE, OVERLOOKING A SWAMPY PLAIN OF DENSE OLD-JUNGLE GROWTH: SARAWAK

As we passed a conspicuous tree on the bank, Tama Saging remarked that, after paddling a whole hour, we should again pass the same tree, but his people had never tried to cut a canal through the narrow neck of land because the ground was too difficult.

DISCUSSING CANAL-BUILDING WITH A KAYAN CHIEF

The Suez Canal was an old story for Tama Saging, but having heard nothing of the Panama Canal, he was much interested at the idea of cutting down a mountain that ships might pass. When I told him that the Frenchmen had tried to build the canal, but were forced to give it up because so many men became sick and died, he exclaimed:

"Ah, yes; very true, Tuan *Sebub hantu*" (because of the spirits). Of course, one can't go to digging up the jungle without getting into trouble with the spirits.

After all, it is only a few years since we could have given no more useful explanation.

For three days we continued up stream, passing from the Tutau into the Milanau River, reaching on the second day the first of the rapids, where the water came rippling clear and cool over the gravel beds—a great relief from the muddy stream of the lower reaches—while each bend of the river gave some new view of the beautiful mountains or luxuriant jungle.

Coming to the mouth of a little stream, we took seven fine fish from a weir made by driving bamboo stakes into the bed of the watercourse. Later, one of the men saw a large turtle, over two feet long, dart into a hole under the bank, where it apparently made up its mind to stay, for no amount of prodding with spears would induce it to come out.

There followed a scene of great excitement, everybody telling everybody else how to get that turtle out, until Tama Saging in desperation finally went part way into the hole himself, pulling the turtle out after him, but not until one of his fingers had been badly bitten.

The Milanau River in its upper reaches is the most beautiful stream I have ever seen. At one point the limestone cliff rises vertical from the water's edge, decorated with fantastic stalagmites and every little crevice filled with delicate ferns. At another point, where great trees cast perpetual gloom on the sluggish waters of the stream, one sees, half concealed by vines and ferns, the entrance to the unexplored recesses of a cave in the limestone mountain. The natives call it the *lobong angin,* or wind cave, from the chilling current of air that usually issues from it.

When the river is low, it is pleasant to camp on a gravel bed in the river bottom, where the stream broadens out and falls noisily over the shingle, for the mosquitoes and other insects are not so bad as in the jungle; but one always runs the risk that he will be awakened by the rising waters to find boats and goods being swept off down stream.

NATURE'S BEAUTIES UNAPPRECIATED

One evening, while sitting out on the gravel watching the sunset and listening to the sounds of the jungle and of the river, I was joined by Migi, the pleasant Dayak boy, who wanted to know why the Tuan every evening sat looking into the sky. As he probably expected to get useful points on my method of observing the omens from the bats and hawks circling in the heavens, he was much disappointed when I replied that I like to watch the clouds at sunset; they are so beautiful—red and yellow and green.

He couldn't see the sense of that, protesting: "They are just the same every night." Then, with friendly interest, he questioned me about my home and country and the names of some of my friends, which he repeated very comically after me.

Our last camp on the Milanau was, indeed, a lovely spot, where a small stream joined the river, forming a delightful bathing pool of cool, transparent water. Great ferns grew about the camp, a splendid tree rose on the opposite bank, breaking into a ball of feathery foliage; beautiful birds flew over the stream and gorgeous butterflies seemed to fill the air.

Rajah Brooke's game laws are a model for all other countries. Since there are no destructive animals (except crocodiles, upon which a bounty is paid), all

MT. MULU, A 9,000-FOOT PEAK, SEEN FROM A CAMP ON THE MILANAU RIVER

One of the chief difficulties encountered in climbing this mountain is to persuade any natives to accompany the explorer; they believe that such heights are the abodes of the most malignant evil spirits.

game is protected, and the naturalist may take a license to collect only two specimens of anything, be it birds, butterflies, or plants.

GAME LAWS OF SARAWAK A MODEL FOR THE WORLD

It may appear surprising that plants should need protection, but the occasion arose when a collector, having discovered a new species of orchid, gathered all he could and then attempted to burn the jungle in the small region where alone the species had been found!

So much time had been consumed in the trip up river that I was able to remain only two days at this delightful spot, where I would gladly have remained a month. One of the days was employed in a walk through the jungle to a point on the Milanau River where the stream comes rushing down, a mountain torrent, through a gorge between the mountains Mulu and Lobong Rimau, the latter meaning "Tiger Cave Mountain," being so named from an inaccessible cave on the side of the mountain.

Tama Saging expressed much concern about my undertaking the walk, telling me of the last *Tuan* who went there, and the very long time he required for the walk. He said so much about it the evening before that I became somewhat annoyed and started off the next morning stripped down for a warm tramp.

I fear now that I was a little inconsiderate of my short-legged friends, and I learned later that Tama Saging was suffering from rheumatism, although he never mentioned it the whole day. But he was a "good sport," remarking on our return that the Tuan was a strong walker.

The charm of the old jungle is to be found in the comparative absence of un-

WHERE THE MILANAU RIVER COMES RUSHING DOWN FROM ITS HEADWATERS AMONG THE PRECIPITOUS LIMESTONE CLIFFS OF MT. MULU
(SEE TEXT, PAGE 151)

"The Milanau River in its upper reaches is the most beautiful stream I have ever seen. At one point the limestone cliff rises vertical from the water's edge, decorated with fantastic stalagmites and every little crevice filled with delicate ferns."

derbrush and the abundance of the great lianas and other plants that grow too slowly to reach perfection on land that is frequently cleared.

Two of my boys climbed one of the large vines shown in the picture on page 158, where is to be seen, also, on the right the slender, graceful leaves of the rattan vine. The picture does not show the sharp spines by means of which this vine pulls itself up through the trees; but when one walks too close to the young shoots of the rattan, he will frequently find himself brought to a very sudden standstill, caught in their tenacious embrace.

THE WOOD-LEECH PEST

Swarms of wood leeches infest the country about Mulu. St. John records that his legs became so covered with sores from their bites that he was obliged to stop traveling, and in my walk of three hours I picked up 17 leeches on my legs.

If one stops in the path and examines closely the twigs and shoots near the ground, he will see these diabolical little creatures in all directions, waving violently to and fro on the tips of leaves, waiting to attach themselves to whatever object comes within their reach.

Nothing but puttees wrapped uncomfortably tight will prevent them from getting to the skin, for they will invariably find an entrance through canvas gaiters and khaki trousers. The best plan is to roll the trousers up to the knee and the stockings down to the shoe; then the leeches will stop where they find bare skin and can be removed as soon as dis-

A TREE ON STILTS IN A SARAWAK JUNGLE

Like the shepherd of southwestern France who follows his flock over marshy Landes mounted on tall stilts, this tree supports itself in the soft soil of the tropical jungle by growing tiptoe, so to speak, on roots spread wide apart.

covered by a drop of alcohol, which also sterilizes the wound.

We all enjoyed a refreshing bath in the mountain stream at the end of our walk; but soon after our arrival the precipitous sides of Mulu were obscured by black clouds, which began to roll down through the gorge, and before we were half an hour on the return trip the rain came down in torrents. But on a tramp through the jungle one must expect to be soaking wet anyway, and it may as well be with rain as with perspiration.

On reaching the camp, we found the little stream which we had forded ankle deep in the morning, now risen above our waists and the camp itself in a very damp condition. I had brought a heavy tarpaulin to spread over the leaf roof made by the natives, but the two roofs together had utterly failed to keep out the deluge.

My boy, Ah Jun, or "Cookie," as the natives called him, had gathered everything in a pile under the best part of the roof and then perched himself on top, where we discovered him squatting under his umbrella—a very unhappy-looking Chinaman.

DAYAKS ON THE WARPATH

On my return to Claudetown, I learned that there had arrived from the Tinjar River the Kayan Pengulu, or leading chief of the Tinjar—Tama Aping Bulieng.

His mission was to report the bad news that eight beastly Dayaks while working jungle products had come across a Punan house during the absence of the men and had killed 24 women and children and one old man, taking away with them 16 heads.

Tama Aping was a most agreeable companion for the few days he remained at the fort—gentle, soft-spoken, and with nothing of the haughty bearing that he assumed for his photograph. Being rather lonesome away from home and lacking, as he pointed out, the white man's resource in books, he spent much

LIKE SOME GIGANTIC SQUIDS OF THE SEA, THE TRUNKS OF MANY JUNGLE TREES IN SARAWAK WRITHE AND TWIST INTO WEIRD SHAPES

The monarchs of this paradise of tropical vegetation receive more watchful protection than those of many of our own forests. The jeluton tree, which yields a valuable gum, is a particular ward of the government, inspectors being appointed to see that it is not improperly tapped.

of his time at the fort, and was very fond of telling of the old days before the government came into the river.

His hands were tattooed, the indication that he had taken a head. Indeed, he said he had taken five when he was a young man, but I think he was bragging.

He was usually accompanied by eight or ten of the fine young fellows who had come down river with him. One evening, when they all arrived at the fort together, I gave a small Manila cigar to each; whereupon Tama Aping abruptly told the young fellows that they might go back down to the bazaar; that he had no further use for them there, and, turning to me, remarked that there was no need of my handing out my good cigars to all those youngsters when he was right on hand to smoke them.

After my return from Borneo, I learned that Tama Aping had become involved in a divorce suit, being summoned as a co-respondent by another prominent Kayan chief. Such events are comparatively rare, the husband and wife among the Kayans generally remaining faithful to their marriage obligations.

DIVORCE PRACTICES IN BORNEO

Divorce is not infrequent before a couple have children; but this is not surprising, when one considers the very close association of husband and wife living continually together in a single room, where any incompatibility of temperament would prove a much more serious burden than in a more complex system of society.

On the other hand, one sees many families living together in the greatest happiness, with attractive little brown children, of whom they are very fond. I recall one couple, very prosperous, thrifty, and

A TAPANG TREE, ABOUT 175 FEET IN HEIGHT, ON THE BANKS OF THE BARAM RIVER: SARAWAK

Hanging on the under side of the branches may be seen black masses of honeycomb.

pleasant people, whose only sorrow was that they had no children; yet they were too happy and contented to separate, although lack of children is usually sufficient cause for divorce.

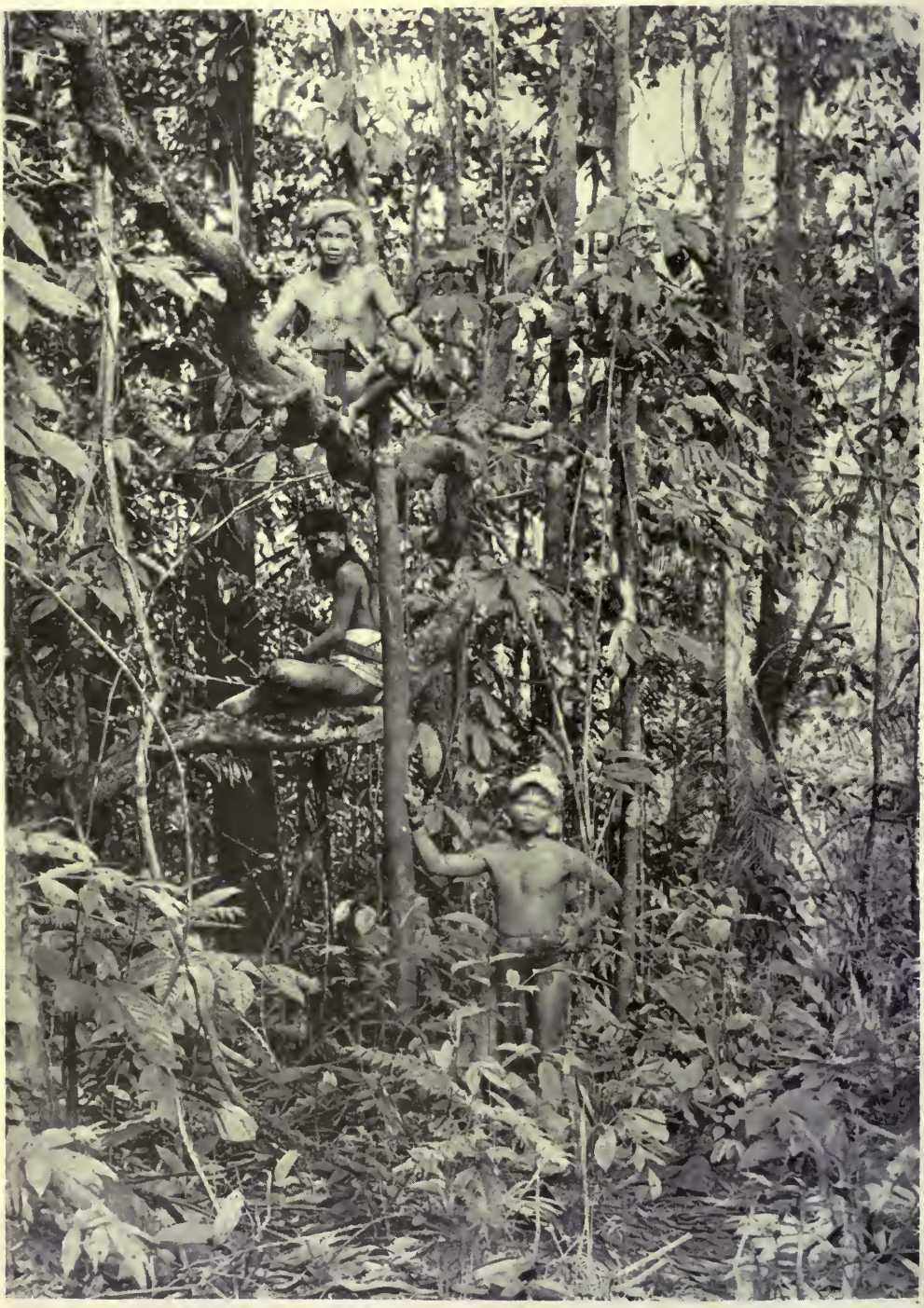
The Punans, about whose murder Tama Aping Bulieng brought the news, belong to one of the most primitive tribes of Borneo. They are timid, harmless people, living in the jungle, usually away from the rivers, cultivating no fields, but getting their food from the wild sago and other jungle plants and from the small game, which they shoot with the *sumpitan*, or blowgun, in the use of which they are exceedingly skillful.

HOW THE BLOWGUN IS MADE

The blowgun is made chiefly by the Kayans, from whom the Punans purchase it. It consists of a hardwood pole about six and a half feet long, the hole

ONE OF THE GIANTS OF THE JUNGLE, THE TAPANG TREE: BORNEO

The native boy is climbing a ladder made by driving hard pegs into the soft trunk, thus gaining access to the bees' hives and honey in the upper branches. The buttresses of the tree are very hard, close-grained, beautiful wood.



THE BEAUTIFUL JUNGLE AT THE BASE OF MT. MULU: SARAWAK, BORNEO

Kubing and Gani have climbed up one of the great vines. At the right a rattan vine rises among the trees. The jungle here is infested with wood-leeches—a most disagreeable pest (see text, page 153).

being about one-quarter of an inch in diameter. The hole is drilled with a long iron rod and polished with a rough leaf—a sort of natural sandpaper.

The slender darts are made from the hard, straight fiber of the nibong palm, sharpened at one end, with a tiny groove cut around the dart below the point, for the purpose of carrying into the wound some of the poison in which the end of the dart is dipped.

This poison, made from the sap of the upas-tree, is so powerful as to cause the death of a man in two or three hours. A piece of pith on the lower end of the dart acts as a piston by which the dart is blown through the tube.

The blowgun that I brought home with me proved of so much interest that my supply of ammunition was speedily exhausted, so that I had to use small steel darts with a cork piston, but of the same weight and length as the native missiles. These are stiffer, but not much sharper than the native darts, and will penetrate a soft pine board fully one-quarter of an inch when blown without special effort from a distance of 40 to 50 feet.

THE FREAKISH GROWTH OF A JUNGLE VINE: SARAWAK

Both the fauna and flora of the Sarawak jungles are protected by law. A collector is allowed to take only two specimens of any one kind, whether the specimen be bird, beast, butterfly, or orchid.

The Punans live in the simplest form of houses—mere leaf shelters—moving from place to place as they exhaust their supply of food.

They are the real jungle people, following for days any other man without his in the least suspecting their presence. In this way they killed a Dayak not long ago who four years before had done them an injury, shooting him with a poisoned dart from a blowgun.

It was for the purpose of preventing, if possible, an outbreak between the Punan and Dayak tribes, as a result of the murder of their women and children, that, shortly after the arrival of the news of the murder, the Assistant Resident was dispatched up river to collect the survivors of the victims and to bring them down river, where they were to receive the heavy fine imposed on the households of the guilty Dayaks and the assurance of the Rajah that summary

LAND DAYAK WOMEN AT THE VILLAGE OF TMONG

Here fashion decrees coils of brass wire on the legs, but not on the arms, as in the village of Pichin (see pp. 111, 113, and 130). Fashion, however, does require the ladies to wear hats!

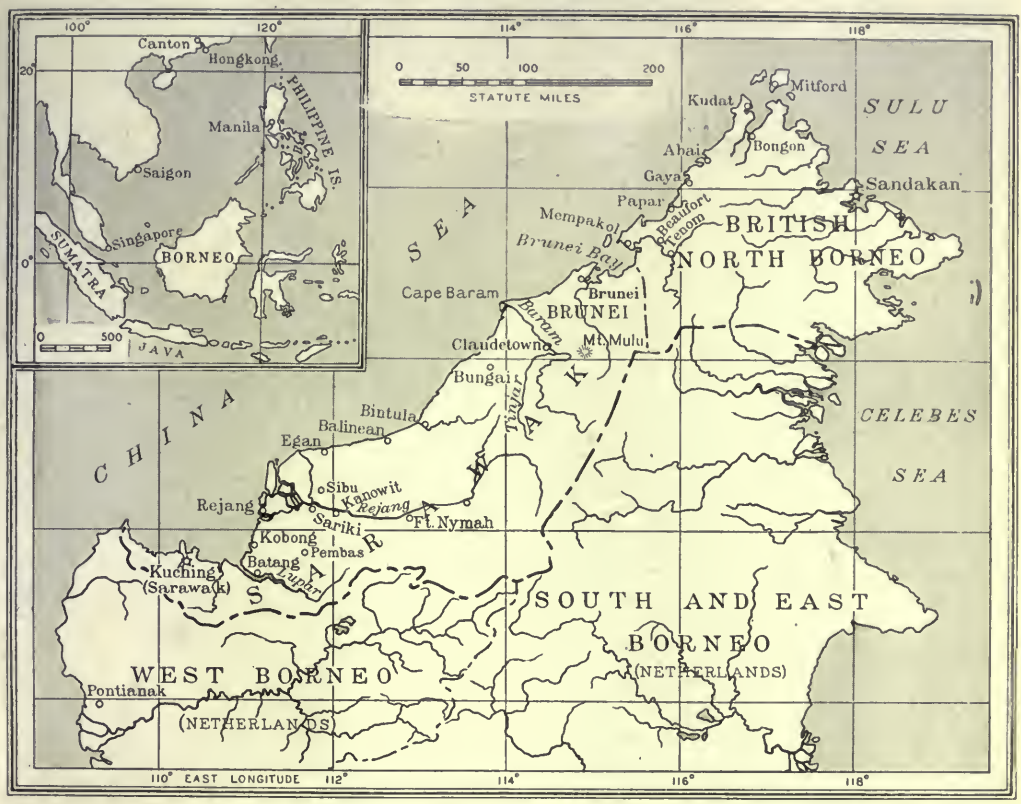
justice would be meted out to the particular Dayaks who were guilty.

It is gratifying to know that the murderers have now suffered the penalty, while their relatives and friends who countenanced the crimes have had to pay a round sum in fines.

The closing incident in this tragedy, after the payment of the fines and the promise that their wrongs would be avenged, was a peace meeting at the Baram fort between the Punans and the Dayaks of the Baram River, who, though not directly connected with the affair (since the murderers were from the Rejang River), were, nevertheless, of the same tribe.

According to the usual ceremony, a pig was killed and the liver examined to determine whether the omens indicated that the peace was to be lasting. The pig was placed on the lawn in front of the Baram fort and, when all were gathered about, Tama Aping Bulieng, the Kayan Pengulu in whose district the Punans lived, began by addressing the pig, charging him with a message to Bali Penyalong, the Great Spirit, urging the pig, in effect, to have a nice liver and give true omens.

Lanting, the Dayak Pengulu, continued the exhortation and the Punan chief finished it; so that the pig had to charge himself with messages in three languages.



A MAP OF SARAWAK

During these harangues Tama Aping squatted by the pig, poking it in the ribs from time to time to make sure of its continued attention.

I think Tama Aping Bulieng felt a little sheepish at his share in the performance, and I am sure that the Dayak Pengulu, Lanting, had much doubt of the value of the ceremony, but the Punan chief took it all very seriously.

At all events, all agreed, when the liver was examined, that the omens were most favorable, for two lines on the liver that nearly joined clearly indicated that the Punans and Dayaks would draw near together and might even intermarry in the future.

HOW THE WHITE RAJAHS CAME TO SARAWAK

Such are the habits of thought and life of this far-away people and such is Sarawak, the history of whose white rajahs began in 1839. At that time the Dutch occupied the southern portion of Borneo, while the northern part of the island was nominally under the rule of the Sultan of Brunei.

Many years before, Brunei had been one of the strongest kingdoms of the Malayan archipelago. Its Sultans had conquered a large part of Borneo as well as several of the southern islands of the Philippines, industry was encouraged, and an extensive trade with China was developed. But luxury and corruption had done their work until there remained only a degenerate Sultan, with a retinue of licentious Malayan nobles, whose sole occupation was to rob the people in order to cater to the pleasures of their master.

The Sultan's capital was, and remains today, the town of Brunei, about 200 miles from the northern extremity of Borneo.

In the days of its glory, when the surrounding hills were covered with pepper gardens and wealthy merchants came annually in fleets of junks laden with the riches of China, the town may have

A SMALL STREAM IN THE SWAMPY JUNGLE: SARAWAK

Near this point the author's canoe narrowly missed brushing from the branch of a tree a small snake, called by the natives "ular brechar," whose bite is so deadly that the Malays say a man hasn't time to take off his coat before he is dead.

A GREEN CATERPILLAR ORNAMENTED WITH FEATHERY PLUMES

One of the many strange insects with which the jungles of Sarawak abound and which repay the entomologist for his journey half-way around the world to collect.

A CURIOUS INSECT THAT USES ITS ANTENNÆ AS A PARACHUTE

This tiny creature, which resembles a plant rather than an insect, springs from the branch of a tree and drops gently through the air, supported by its downy tentacles.

merited in some degree its appellation of the Venice of the East; but for the past century it has been nothing more than a few score of small wooden houses built on piles on a muddy bank which is bare at low tide, exposing an accumulation of refuse from which a stench arises that is a novelty even to one who has become accustomed to the varied odors of the East.

The Sultan's domains extended along the northwest coast nearly to the westerly extremity of the island, where the territory included in the basins of the Sarawak, Lundu, and Samarahan rivers constituted the province of Sarawak, with the town of Kuching, on the Sarawak River, for its capital.

Sarawak was inhabited chiefly by Malays, Land Dayaks, and Chinese, and had, at times, been independent under Malay rulers; but in 1839 its government was in the hands of a vassal of the Sultan, the Rajah Muda Hasim, weak and incompetent, but apparently an amiable man, not entirely devoid of humanitarian instincts; for he did, on one occasion, avail himself of an opportunity to render timely assistance to some shipwrecked English sailors. This event was the cause of James Brooke's first visit to Sarawak, which led to his great work there and the establishment of the white rajahs.

This action of the Rajah was so unusual that the Governor of Singapore and the Singapore Chamber of Commerce resolved to recognize his generosity by sending presents and a letter of thanks.

James Brooke, the son of Thomas Brooke, of the East India Company's civil service, was chosen to carry out this mission. He sailed from Singapore in July, surveyed parts of the coast of what was destined to become his domain, finding its position so much in error that he was "obliged to clip some hundreds of miles of habitable land off the charts."

On the 15th of August he anchored in the Sarawak River, at the town of Kuching, where he was well received by

THIS OLD MALAY FISHERWOMAN OF KUCHING WAS MUCH ANNOYED BY THE CHINESE "RIKISHA" COOLIE, WHOM SHE SUSPECTED OF HAVING DESIGNS ON HER FISH: SARAWAK

IN KUCHING ON CHINESE NEW YEAR'S DAY THE CHINESE CHILDREN, DRESSED IN THEIR BEST CLOTHES, ARE SENT RIDING IN "RIKISHAS": SARAWAK

A CHINESE PUPPET SHOW EXHIBITED IN FRONT OF THE CHINESE TEMPLE IN KUCHING, THE CAPITAL OF SARAWAK

Hasim, who gave him permission to visit the Lundu, Samarahan, and Sadong rivers, which were unknown to Europeans; but as the tribes of the interior were in insurrection, Mr. Brooke was not able to explore the country, and after six weeks he departed, greatly to the regret of Hasim, whose confidence he had won.

Mr. Brooke again sailed from Singapore on August 18, 1840, for Manila, intending to pay only a short visit to Hasim on the way; but he found his former friend distracted by rebellion in his country, which he was powerless to control. The visitor reluctantly consented to give assistance in restoring order.

In return for this service, Hasim agreed to give Mr. Brooke the government and trade of Sarawak, with the title of Rajah; for Hasim, who was heir presumptive to the throne of Brunei, foresaw his own prestige heightened if he could return to Brunei, leaving Sarawak pacified in Mr. Brooke's control.

But when Hasim saw his country at peace as the result of Brooke's efforts, he forgot his obligation to the visitor and connived in a plot against the latter. This failed, however, and he was obliged to fulfill his agreement and proclaim Brooke Rajah and Governor of Sarawak in September, 1841. The Sultan of Brunei confirmed the deed given by Hasim and presently also acknowledged Rajah Brooke's complete independence.

Rajah Brooke was recognized as an independent sovereign by the United States in 1850 and by Great Britain in 1863.

Sir James Brooke died in 1868, naming as his successor to the raj his nephew, Charles Brooke. Sarawak was made a British Protectorate in 1888.

THE NATIVE SECTION OF KUCHING, SARAWAK, THE CAPITAL OF THE LAND OF THE WHITE RAJAHS

The native portion of the town is divided into kampongs, or clusters, and is built on both sides of two reaches of the Sarawak River, about 23 miles from its mouth. The European section of the town occupies the heights on the left bank of the river. The principal buildings are forts, barracks, court-house, a museum, and the palace of the Rajah. The capital has a population of about 30,000.

Sir Charles Brooke, from the time when he entered his uncle's service in 1852 until his death, in his 88th year, was loved by his people, and in recent years almost worshipped by them, because of the constant interest he evinced in their welfare. While he endeavored to develop trade, he exerted great pains to protect his people against exploitation at the hands of foreigners, whether European or Asiatic.

On May 17, 1917, Charles Vyner Brooke (born 1874) succeeded his father as the third Rajah of Sarawak.

To this day the principle of the government has remained as the first Rajah stated it toward the end of his career, "to rule for the people and with the people, and to teach them the rights of freemen under the restraints of government. . . . The wisdom of the white man cannot become a *hindrance,* and the English ruler must be their friend and guide or nothing. . . . They are *not* taught industry by being forced to work. They take a part in the government under which they live; they are consulted about the taxes they pay; and, in short, they are free men."

The success of the Rajah's efforts was quickly indicated by a large increase in the population through immigration from Dutch and Brunei territory.

From Kuching there is a short railroad that is gradually being extended up country, but there are few roads, so that travel and trading are mostly confined to coastwise and river journeys. Jungle produce—various gums, rattans, etc.—comes down the rivers from the interior, while near the capital are many Chinese pepper gardens and some rubber plantations. Gold, coal, and a few other minerals are produced, and in recent years petroleum has been exported in considerable quantity.

Only men of culture and refinement can win the confidence of the native; for well-bred Malays are noted for their courtesy and good manners, and many of the pagan tribes possess to a remarkable degree the instincts of the gentleman. The Kayans in particular are very quick to resent bad manners, and a gruff, uncivil bearing will produce the same results in a Bornean house as in other parts of the world.

CHINESE NEW YEAR'S: SARAWAK

A YOUNG KAYAN BEAU

The hairs of his eyebrows have been pulled out with brass tweezers by the lady whom he loves, thus signifying her deep attachment to him and making him very beautiful. The practical advantage of this detail of courtship appears when one considers how long it will be before Lopit can tell some other girl that she is the first one he has ever loved.

AMERICAN BERRIES OF HILL, DALE, AND WAYSIDE

In the accompanying illustrations the National Geographic Magazine *reproduces in natural colors a beautiful series of paintings of 29 species of American berries and their blossoms by the gifted artist-naturalist, Miss Mary E. Eaton. This is the fourth of* The Geographic's *series of matchless color pictures of American Wild Flowers. The first series was published in May, 1915, followed by those of June, 1916, and Our State Flowers in June, 1917. The series comprise 64 pages in full color, depicting 105 species, each accompanied by a concise and interesting description of the plant's habitat and its habits.*

SPICEBUSH

Benzoin æstivale (L.) Nees [Plate I]

Dwelling in deep, damp woods from Maine and Ontario to Kansas and Carolina, the spicebush, with its dainty yellow flowers and its seductive odor, is a real harbinger of spring. Flowering from March to May, its blossoms arrive even before the pussy-willow wakes up, and vie with the shadbush in the promptness of their advent. When they first appear, the flowers nestle close to the bare branches.

One species of the spicebush is found in abundance in eastern Asia. On account of the toughness of the wood and its aromatic fragrance, natives prize it for toothpicks. A new perfume, called Kuromoji, made from the essential oil of this plant, is now much in demand.

This shrub has several aliases—"Benjamin-bush," "wild allspice," and "fever-bush."

The sassafras is closely related to the spicebush, both playing host to the caterpillar of the swallow-tail butterfly.

The spicebush played its rôle in the Revolutionary War. Allspice was kept out of the American market, and the women of the times used the powdered berries of this plant as a substitute. During the Civil War its leaves were used in making a brew that took the place of tea.

BLACK ALDER

Ilex verticillata (L.) A. Gray [Plate I]

Flowering in June and July, from Nova Scotia to Florida and westward to Missouri, the black alder, a member of the holly family, so gladdens the months of snow and ice with its bright fruit that it is often known as the "winter-berry." Long after the frost has turned the leaves black and sent them away to enrich the soil for another summer's coming, its abundant red berries, clinging to leafless branches, dissipate the desolation of many a winter scene.

The black alder is a handsome shrub, growing from 5 to 10 feet high, with dull, warm gray bark and nearly vertical stems and branches. It flourishes especially in low, swampy ground, in Virginia sometimes reaching a height of 25 feet.

This species has qualities that have won for it a place in materia medica. The bark is dark, cloudy gray in color, bitter to the taste, and astringent in its action. An infusion made from it, or even from the leaves, has been found to possess tonic and alterative properties. The berries are purgative in their action and serve as a vermifuge, forming one of the pleasantest adjuvants in children's remedies.

During the Civil War the Southern people were hard pressed for medicines. A survey of the herbal resources of Dixie was made, and the berries and bark of the black alder were especially commended. They were used in the treatment of intermittent fevers and diseases which developed as a result of debilitated constitutions, especially gangrene and mortification, and as astringents for ulcers and chronic cutaneous diseases.

Just now the black alder is making a strong bid for favor as a cultivated plant. Showing a great mass of color, holding its berries longer than almost any other species, possessing attractive foliage that never grows shabby, it is ideal for decorative purposes.

AMERICAN MOUNTAIN ASH

Sorbus americana Marsh [Plate I]

The outstanding fact about the mountain ash is that it is really not an ash at all, but belongs to the rose family. That family is not less famous for its fruits than for its flowers; for blackberries, strawberries, and raspberries are as delightful to the palate as roses, or cinquefoils, meadow-sweets, hardhacks, avens, or silver-weeds can be to the eye. Goatsbeard and ipecacs are likewise members of the same versatile family, as are also queen-of-the-prairie and the agrimony.

There are about thirty species of ash of the Sorbus group. Flourishing from Labrador to Manitoba, and reaching south of the latitude of New York and the Great Lakes only where it can find mountains, the tree grows on rocky bluffs with wild plums and straggling beeches, attaining a height of from 20 to 40 feet.

The flowers appear in May and June in great masses or panicles of white. The leaf turns a bright, clear yellow in the fall. The berries, to which many a bird has flown for salvation in a snowy spell, remain on the trees

all winter. They are sometimes used in making astringent home remedies and occasionally are eaten raw, though said to be harsh in flavor, with a nauseous undertaste, which very few people relish. Infused with water, they furnish a pleasant subacid beverage, and by distillation a powerful spirit.

The aliases of the mountain ash are as numerous as those of a yeggman and as suggestive as those of a hobo. "Dogberry," "fowler's service," "Indian mozemize," "round wood," "witchwood," "quickbeam," "Rowan tree," "wichen," "whistle-wood," and "wild ash" are a few of the names assigned to it in the vernacular.

The fruit of the mountain ash is not, strictly speaking, a berry. Rather it is a pome, or apple-like fruit.

SMOOTH SUMAC

Rhus glabra (L.) [Plate I]

Belonging to the cashew family, which includes such diverse denizens of flowerland as the vinegar tree and the smoke bush, the poison ivy and the cadju tree, the smooth sumac is one of about 120 species widely distributed throughout the warm and temperate regions of the earth. Some authorities claim that it has a geographic range wider than that of any other tree or shrub. Of all the sections of the United States, the California floral region alone seems closed to it.

Environment works such changes in it, however, that a description which would fit in one section would not necessarily apply elsewhere.

The smooth sumac often grows 10 feet high, usually in colonies, seldom singly. Frequently confounded with the larger stag-horn sumac, sometimes called the vinegar tree, it thrives in almost any kind of soil and multiplies by stems that travel—like Hamlet's ghost—underground. One of the most inoffensive of plants, so many people have had such sorrowful experiences at the hands of its cousin, the poison sumac, that the innocent *Glabra* has suffered from the evil reputation of the wicked *Venenata*.

In early summer the sumac is a symphony of greens. Its large, fern-shaped leaves suggest some rank, tropical growth, and dense panicles of greenish white flowers thrust themselves above the foliage. Long before the other trees and shrubs of forest and field begin to dress up for the final color carnival of the year, the sumac attires itself for the splendid pageant. Deep in the shady recess of some jungle of brier or fern, suddenly a blood-red dagger appears—one solitary leaflet, perhaps—but suggestive of the glory that is to be. Soon entire leaves are stained with the scarlet dye that Jack Frost concocts in the leaf laboratory, and before long Nature, impatient at the slower processes, upsets her paint-pot, leaving streaks and splashes over wood and dale and field.

The berries cluster on large, rigid stems, making them veritable torches of cardinal-colored fruit.

The berries have a sour, astringent taste, and are said to make a cooling drink when infused in water. Such an infusion yields a black dye particularly adapted to the coloring of wool. The leaves are rich in tannic acid, and are sometimes used as a substitute for oak bark in tanning leather. The bark is used often as a mordant for red dyes—a mordant being a preparation that will cause a fiber to absorb and hold fast a given color.

BLUE COHOSH

Caulophyllum thalictroides (L.) Michx. [Plate II]

Strange in structure as in habit, shunning the roadside and the haunts of man with all of the timorous traits of a hermit thrush or the fearsome nature of a wild deer, the blue cohosh hides in the deepest recesses of thick forests. Its structural cells contain substances that have not yet yielded their secrets to the test tube of the chemist.

The habitat of the blue cohosh is extensive. It occurs throughout southern Canada and far down in Dixie. Only where the leaf mold is thick does it reside, being a rich liver. A native of America, it is variously known in the provincial tongue as "pappoose root," "squaw root," "ginseng," "blueberry root," "yellow ginseng," etc. It is an inconspicuous herb in spring, but in the fall attracts attention by its graceful aspect and brilliant coloring. When young the whole plant is covered with bloom.

The flowering time of the blue cohosh is April and May. Its blossoms are purplish, or yellowish green, and scentless. The berry, literally a seed, as large as a pea, resembles a pitted fruit. When roasted the seeds make a fair substitute for coffee.

The family relationships of the blue cohosh are numerous and versatile. It belongs to the barberry family, which includes the barrenwort, the Oregon grape, the May apple, and the twinleaf.

ROUNDLEAF GREENBRIER

Smilax rotundifolia (L.) [Plate II]

The common names of this brier are as numerous and as varied in their etymology as its relatives are numerous and varied in their attributes. "Bamboo," "bread - and - butter," "rough-bindweed," "wait-a-bit," "dogbrier," "biscuit-leaf," and "Devil's hopvine" are some of its pseudonyms. It is a member of the lily family, and is so widely known that it figures in the geography of the eastern section of the United States, lending its name to mountains, rivers, counties, and summer resorts. Although a cousin of such diverse species as the wild garlic and the Indian poke, it bears no relation to the florist's staple vine, called "smilax," which belongs to an entirely different family and originated in South Africa.

The roundleaf greenbrier is a great climber, its tough tendrils laying hold upon any object in their path. It possesses all the attributes of

a barbed-wire fence, and woe betide the trespasser within its precincts. Its prickles are so sharp and so hard to break away from that most of the creatures which disturb birds' nests give them a wide berth.

The leaves of the greenbrier are usually heart-shaped, or nearly round, with a puckered appearance. About the last in the thicket to fall, the mottled foliage of the frost-painted greenbrier still flutters in the breeze long after the woods are brown and bare. The flowers come from April to June, but they are insignificant little blossoms which invite countless flies to their board rather than gaudy-winged butterflies and long-tongued bees.

BLACK GUM

Nyssa silvatica Marsh [Plate II]

The black-gum tree occurs between Maine and Michigan on the north and Florida and Texas on the south, preferring a rich, inclined-to-be-swampy soil. Its highest development is reached on the slopes of the southern Appalachians, where it sometimes attains a height of a hundred feet and a stump diameter of five feet. It usually is found in association with the white oak, the tulip tree, the sugar maple, the cucumber tree, the wild cherry, the ash, and the buckeye.

The shape of the tree is variable. Some are tall and graceful; others are broad and squat. When it grows in the forest, the trunk is usually straight and free from defects of any sort. But out in the open the branches are often broken by storms, causing the heart of the tree to decay, thus making it hollow.

Wide of distribution, the black gum is also a tree with a variety of local names, such as "sour gum," "tupelo," "hornbeam," "old-man's beard," "upland yellow gum," etc. The South calls it the "sour gum," the West the "pepperidge," and New England the "tupelo."

The bark is thick, light brown, often tinged with red. In the fall every leaf assumes a rich scarlet hue, making the blazing crown of a hardy tree a notable element in the landscape it graces.

The flowering season of the black gum is April and May. The blossoms are inconspicuous, the petals forming no prominent corolla. The berries of the black gum are drupes, with a pit inside, and are meaty like a cherry. They are rather bitter until frosts have set in, after which the birds are very fond of them.

The black gum has been called the King Lear of the forest—an apt designation to any one who has observed a fine tree overtaken by the decay of age. Preyed upon by more than fifty species of fungi, it usually begins to die at the top, which gives it a melancholy aspect as death creeps down toward its lower branches.

WILD BLACK CHERRY

Prunus serotina Ehrh. [Plate III]

Beautiful alike in the texture of its wood and in its appearance both in flowering and fruiting time, the black wild cherry occurs from Nova Scotia west to the Rocky Mountains and as far south as Peru. It thrives either in rich, moist soils or on rocky cliffs; and while nowhere abundant, in favorable localities numerous groups are found.

The tree grows from 50 to 100 feet high, with reddish brown bark marked with horizontal lines and rough excrescences. In old trees the bark becomes blackish brown; in saplings it is either purplish brown or tinged with green. Of rapid growth, it dies young, but serves well as a nurse tree in forest plantations where luxuriant foliage is desired. The leaves are from two to five inches long, usually turning pale yellow or orange in the fall, although younger growths frequently take on a garnet hue.

The flowering season of this tree is April to June. The pure white blossoms convert the whole crown into a snowy, fragrant cloud. The bark and leaves are aromatic but bitter, owing to the presence of hydrocyanic acid. The same property occurs in the flowers, which on wilting give off a cyanogenetic odor that is quite objectionable to many people, causing severe headache. Cattle have been killed by eating the wilted leaves, and children made ill by eating too many of the cherries.

Few trees figure more in the pharmacopœia than this one. Chemical analysis of the bark reveals starch, resin, tannin, gallic acid, fatty matter, lignin, red coloring matter, salts of calcium, potassium and iron, a volatile oil, and prussic acid. The bark is widely used in preparations employed in the treatment of hectic fevers, scrofula, and tuberculosis.

The fruit ripens in August and September. The cherries, which are dark purple or black, have a thick skin, dark flesh, and abundant and slightly astringent juice. They are a much-prized food in birdland. The fruit is used extensively in making jellies and as a flavoring for alcoholic liquors; hence its popular names: "whiskey cherry," "rum cherry," etc. Cherry brandy, cherry bounce, cherry cordial—these are but a few of the nectars manufactured from wild black cherries.

SWEET CHERRY

Prunus avium L. [Plate III]

The sweet cherry is an immigrant from the region of the Caspian Sea and Euphrates River. Just when the sweet cherry landed in America is not recorded. Its naturalization papers have never been located. But it has been thoroughly Americanized.

The tree has a long list of local names—among them, "bird cherry," "brandy mazzard," attaining a height of 75 feet, it has a fine, rounded, pyramidal crown when young, but as it grows older it acquires more portliness, spreading out like a field oak.

Itself a wild growth, it has a distinguished progeny that acknowledge and enjoy domestication—the delicious blackheart, the splendid honeyheart, the fine wax, and the acid sour cherry, all tracing their lineage to the wild sweet cherry or its cousin, the wild sour cherry.

The flowering time of the sweet cherry is

Photograph by Edwin Hale Lincoln

A HIGHBUSH BLUEBERRY LOADED WITH BLOSSOMS

Crossed with the lowbush blueberry, this plant in cultivation produces a hybrid which yields blueberries as big as Concord grapes. A single bush has been known to yield half a gallon of berries (see "The Wild Blueberry Tamed," by F. V. Coville, NATIONAL GEOGRAPHIC MAGAZINE, June, 1916).

April and May. With their reddish white and pink petals in rich and fragrant profusion, the blossoms have a world of insect visitors who dance and feast away the day amid the abundance of nectar and pollen.

Japan is par excellence the cherry country. It has a hundred or more varieties, with white, yellow, pink, and rose-colored blossoms. They grow throughout the length and breadth of the empire and are planted in vast numbers everywhere—in temples, castle grounds, parks, gardens, along streets and highways, and by ponds and rivers. A three-mile avenue of cherries planted nearly two hundred years ago by the Shogun Yoshimune, in the vicinity of Kogenal, some ten miles from Tokyo, forms a sight never to be forgotten by the visitor. Some of the trees are 70 feet tall, with crowns having a spread equal to their height, and with girths of trunk up to 12 feet.

When William Howard Taft visited the Orient on his tour of the world before becoming President, the Japanese gave Mrs. Taft a wonderful collection of flowering cherry trees. These have been planted along the Speedway in Washington, and a century hence that wonderful driveway will rival the great Shogun avenue at Kogenal.

HIGHBUSH BLUEBERRY

Vaccinium corymbosum L. [Plate III]

Who that has eaten a real blueberry roll or partaken of a piece of genuine, unadulterated, well-baked blueberry pie can doubt that Frederick V. Coville was right when he declared that the blueberry had the cranberry beaten, because "you can't use cranberries without buying a turkey to eat with them!" This eminent authority has written about the blueberry in previous issues of THE GEOGRAPHIC (see the NATIONAL GEOGRAPHIC MAGAZINE for February, 1911, May, 1915, and June, 1916).

THE EARLY HIGHBUSH BLUEBERRY

Vaccinium atrococcum (A. Gray) Heller [Plate III]

The early highbush blueberry has practically the same range as its cousin mentioned above. It flourishes from Maine and Ontario to North Carolina and westward. The shrub has shreddy bark and its green branches are covered with minute warty excrescences. The young twigs are downy, as are also the under surfaces of the leaves. The foliage does not develop until after flowering time. The blossoms are yellowish or greenish white, tinged with red; they are small and appear about ten days earlier than those of *Vaccinium corymbosum*. The fruit likewise ripens earlier. The berries are black and shine like beads, but are without the waxy bloom that serves as a natural mackintosh for so many plants.

AMERICAN BITTERSWEET

Celastrus scandens L. [Plate IV]

Member of the staff-tree family, the American bittersweet is less a tree and more a vine, with numerous common names, including "climbing orange root." The fruit, which is a capsule and not a berry, bursts in the frosty days of fall, and, crinkling back, thrusts forward the bright scarlet arils inclosing the seeds.

Not content to twine itself around other vegetation, this vine often outdoes the kitten that plays with its own tail, twisting its own stems together, frequently into a rope of great strength. It does not cling like the friendly ivy, but, with the constricting power of the python, it winds and twines about a sapling with such persistent strength that the young tree is often killed.

The range of the American bittersweet is from eastern Canada to South Dakota and from North Carolina to New Mexico, the shrub being especially abundant in the Middle West. The flowers put in their appearance in June. They are creamy white, small, inconspicuous, and scentless. The berry-like capsules reach their full development in September. They remain on the stems all winter, unless eaten by the birds. If gathered and dried on the branches before frost, they become hard and durable and will retain the bright freshness of their coloring for several years.

If one may judge from the use made of this plant by the primitive Indians, it has a right to be called the staff tree. When their little patches of maize and other crops failed and famine threatened, the red man resorted to the use of the American bittersweet.

SILKY CORNEL

Cornus amomum Mill [Plate IV]

The dogwood family, to which the silky cornel belongs, is one of ancient lineage and distinguished associations. Virgil refers to the javelins made of myrtle and cornel wood which pierced the body of Polydore. Pausanias mentions a festival celebrated in honor of Apollo at Lacedæmonia, which was instituted by the Greeks to appease the wrath of the god at their having cut down the cornel trees on Mt. Ida. Romulus, wishing to enlarge the boundaries of Rome, hurled his spear to mark the extension permitted by the gods. It stuck into the ground on Palatine Hill, and from the handle, made of cornel wood, grew a fine tree—an event held to foreshadow the greatness and strength of the Roman State.

The silky cornel is one of the aristocrats of the family. It prefers swamps and low, damp ground, and grows almost exclusively amid such surroundings. In territorial limits it is a little less restricted; for it is found from New Brunswick to Florida and wanders as far west as Nebraska. Indigenous to North America, it is usually found in company with the true arrowwood. In the North a shrub that seldom grows over 10 feet tall, in the South it becomes a fair-sized tree. It flowers in June and develops fruit before frost time. The berries are a beautiful pale blue with a silvery sheen.

Among the common names by which the silky cornel is known are "blue-berried dog-

SPICEBUSH
Benzoin aestivale (L.) Nees
AMERICAN MOUNTAIN ASH
Sorbus americana Marsh.

BLACK ALDER
Ilex verticillata (L.) A. Gray
SMOOTH SUMAC
Rhus glabra L.

ROUNDLEAF GREENBRIER
Smilax rotundifolia L.

BLUE COHOSH
Caulophyllum thalictroides (L.) Michx.

BLACK GUM
Nyssa sylvatica Marsh.

WILD BLACK CHERRY
Prunus serotina Ehrh.

SWEET CHERRY
Prunus avium L.

HIGHBUSH BLUEBERRY
Vaccinium corymbosum L.

EARLY HIGHBUSH BLUEBERRY
Vaccinium atrococcum (A. Gray) Heller

American Bittersweet
Celastrus scandens L.

Silky Cornel
Cornus amomum Mill.
Bayberry
Myrica carolinensis Mill.

Mapleleaf Arrowwood
Viburnum acerifolium L.

IV

American Cranberry
Oxycoccus macrocarpus (Ait.) Pursh

Shadbush
Amelanchier canadensis (L.) Medic.

Sweet Elder
Sambucus canadensis L.

WINTERGREEN
Gaultheria procumbens L.

BLUELEAF GREENBRIER
Smilax glauca Walt.
CORAL BERRY
Symphoricarpus orbiculatus Moench

BUNCHBERRY
Cornus canadensis L.

VI

SNOWBERRY
Symphoricarpus albus (L.) Blake

LONGSPINE THORN
Crataegus succulenta Schrader

AMERICAN HOLLY
Ilex opaca Ait.

HIGHBUSH CRANBERRY
Viburnum americanum Mill.

Black Chokeberry
Aronia melanocarpa (Michx.) Britton
Purple Chokeberry

Red Chokeberry
Aronia arbutifolia (L.) Ell.

wood," "red brush," "kinnikinnik," "squaw-bush," "swamp dogwood," etc.

This species has often served as a substitute for quinine, decoctions being made from the bark and tender twigs. The fresh bark is chopped, pounded, mixed with alcohol, and filtered. The resulting tincture is of a beautiful madder color and possesses an odor like that of the sugar cane when its juices are slightly soured. The Indians scrape the inner bark and smoke it in their pipes when tobacco is scarce.

BAYBERRY

Myrica carolinensis Mill [Plate IV]

Belonging to the Myricaceæ family, the bayberry is a cousin of the sweet fern and the sweet gale. It is known also as "bay myrtle" and "tallow shrub." Its favorite place of abode is sandy soil, and its habitat extends from Alaska and Nova Scotia to Florida. It owes its names "waxberry" and "tallow shrub" to the service which it rendered to the colonists in America. Animal fats were not overplentiful in those days; but the farmer had a large family of children, and he believed that they could gather berries for making candles with more edification than they could play—according to the stern Puritan views of the times.

Candles made from bayberry wax are more brittle and less greasy than those made from tallow. They are a curious, almost transparent green, and when the flame is put out the resulting odor is as sweet and pungent as incense.

The bark and roots of the bayberry possess medicinal properties. The roots, when boiled, yield a tea reputed to be a specific for headache; to the bark are attributed properties valuable in the treatment of jaundice and in making soothing poultices for sores and ulcers. The Scotch Highlanders use the leaves, which are bitter and aromatic, as a substitute for hops in the brewing of beer, it being alleged that they increase the intoxicating effect of that beverage.

The Highland clan Campbell wears the sweet gale, the Scotch edition of the bayberry, as its family badge.

MAPLELEAF ARROWWOOD

Viburnum acerifolium (L.) [Plate IV]

The mapleleaf arrowwood is a member of the honeysuckle family, having as cousins the elders, the hobble-bushes, the sweeet viburnums, the black haws, the bush-honeysuckles, the coral-berries, the snowberries, and the horse gentians. It is a shrub, from three to five feet high, and, except for its flowers and fruit, would pass almost anywhere as a young maple shoot.

With dense, spreading foliage, the bush has a preference for the shade of woodland thickets. Ranging from New Brunswick and Minnesota on the north to Kentucky and Georgia on the south, it prefers rocky, broken ground rather than damp soils. The heights back of the Palisades of the Hudson are favorite haunts of the viburnum.

The bayberry grows in almost sterile soil.

A close relative of the snowball tree, this species bears profuse clusters of small, white, scentless blossoms. The fruit is a dark, purplish berry the size of a pea.

AMERICAN CRANBERRY

Oxycoccus macrocarpus (Ait.) Pursh. [Plate V]

Together with blueberries, huckleberries, snowberries, trailing arbutus, and wintergreen, the cranberry belongs to the heath family, which also embraces the azaleas, the lilacs, the laurels, the rhododendrons, the heathers, and some of the rosebays and rosemaries.

The plant is a trailing evergreen, with a rather stout stem, growing from one to four feet long. It is very tough, in spite of its delicate proportions, and is found in open bogs and swamps from Newfoundland to western Wisconsin, with scattered colonies as far south as the Carolinas and Arkansas. Its favorite haunts, however, are in Massachusetts, New Jersey, northern Michigan, and Wisconsin. June time is blossom time in cranberry land, and its flowers are as pink and pretty as its berries are round and red. The former are tube-shaped and pendant from slender, swaying stems.

First domesticated about 1810, not until some four decades later did its merits become widely known and its berries find their way into the homes of the people of the nation. Today the estimated production is around fifty million quarts a year—a pint for every human being in the United States.

SWEET ELDER

Sambucus canadensis (L.) [Plate V]

Ranging from Nova Scotia to Manitoba and from Florida to Texas, with colonies in the West Indies, the sweet elder climbs mountains and gladdens valleys alike.

The brittle twigs and young sprouts are full of pith, while the older stalks are nearly solid. The hardy leaves are often seen unchanged in hue, frozen stiff on the stems, in December. So repugnant to insects is the odor of the sweet elder that an eighteenth century gardener recommends that cabbages, turnips, etc., be whipped with young elder twigs to preserve them from insect ravages. An infusion of elder leaves is often used today to keep bugs from vines.

The clustered flowers of the elder remind one of mellow old lace. They give off a heavy, sweetish, and to many people a rather sickening odor. The flowers appear from June to August. Elder flower water is much used by the confectioner. A perfume made with the flowers, distilled water, and rectified spirits serves to flavor wines and jellies. The young buds are sometimes pickled like capers. The dried flowers contain a volatile oil, resin, wax,

tannin, etc., and possess stimulating medicinal properties.

The juice of the elderberry was used by the Romans to paint the statues of Jupiter red on festive occasions, and in convivial history has been rather widely used as an adulterant of grape juice.

Its specific name is supposed to be derived from *sambuke,* an ancient musical reed instrument—the prototype of the crude hollow-stem elder whistle of the bare-foot country boy.

These same hollow stalks of the elder play an important rôle in every maple-sugar camp. Cut into appropriate lengths and inserted in the incisions of the tapped trees, they serve to conduct the rising sap into the waiting pail or sugar trough.

No shrub is more generous with its fruit than the elder. Other crops may fail, but this plant always produces a full harvest, never yielding to the caprices of the season, be it wet or dry, hot or cold.

SHADBUSH

Amelanchier canadensis (L.) Medic. [Plate V]

The shadbush belongs to the rose family and is a cousin of the chokeberry, the apple, and the hawthorn. With green, toothed leaves, gray and sepia brown twigs, and red and pink fruit, it is a beauty in the fall, just as it is in the spring, when the white, pink-trimmed blossoms appear. Among its local names are "boxwood," "Canadian medlar," "Juneberry," "sand cherry," "service-berry," "sugar-berry," "sugar pear," "bilberry," "shadblow," "snowy mespilus," and "May cherry."

This species is a shrub or small tree varying from 8 to 25 feet in height, usually attaining its maximum growth in swamps and along river courses. Its habitat extends from Newfoundland to the Gulf of Mexico and throughout the Middle West. The fruit forms in June and July, the berries varying in size from that of a currant to that of a morello cherry. When they are in season, boys, robins, and bears alike feast upon them. The color of the fruit varies from crimson, through magenta to purple or black.

The wood of the shadbush is known as "lance-wood," and many a fishing pole and umbrella handle has been fashioned from it. The Indians often made bows and arrows from it, and it is in considerable demand for tool handles.

In some communities the shadbush is cultivated, being propagated from seeds as readily as apples. It has been found a satisfactory stock upon which to graft the pear and the quince, both of these fruits maturing earlier when so grafted and the resulting trees enduring the winter more easily.

The pemmican of the Indians was composed of deer or buffalo meat dried and pounded to a powder, to which was added dried Juneberries or blueberries, the mixture being then stirred into boiling fat. When cooled, the mass was molded into cakes. When the Lewis and Clark expeditions made the first overland journey to the Pacific Ocean, their provisions ran short while in the region of the upper Missouri River, and it was one of the Amelanchier species, *alnifolia,* that came to their rescue with a bountiful supply of luscious berries.

WINTERGREEN

Gaultheria procumbens L. [Plate VI]

The wintergreen, with its warm-hued berries, has many names: "checker-berry," "boxberry," "deerberry," "groundberry," "ivy-berry," "ginger-berry," "grouseberry," and "spiceberry," "mountain tea," "Jersey tea," "Canadian tea," and "waxy plum." Its tender leaves are known as "little Johnnies," "pippins," "drunkards," and by other names of like import, though they have naught whatever about them to suggest stage entrances, or gaiety, or inebriety.

The wintergreen is a woody vine with an underground creeping stem, from which spring erect flowering branches from three to five inches high. These branches bear at their tops crowded groups of aromatic leaves.

The habitat of the wintergreen is the quiet solitude of damp woods, extending as far north as Newfoundland and Manitoba. Its real headquarters are the Andes Mountains, on whose slopes it appears in nearly a hundred different species. A few species are found in Asia, but wherever it grows it will usually be found under the shade of the pines. Blossoms appear any time between early spring and late fall, and the bright-red berries seem to have all seasons for their own. They are so plentiful in southeastern Massachusetts that they are sometimes seen on the fruit stands in the Boston markets.

The spicy aromatic flavor of the wintergreen appears equally in leaf and flower and fruit. It is the active element in oil of wintergreen, used widely as a scent for soap, a flavor for chewing gum, candy, etc., and as a camouflage for bad-tasting medicines.

One of the strange tricks of nature appears strikingly in the analysis of the oil of wintergreen. How a little creeping plant can take substances from the soil and air and manufacture them into a compound that is exactly like another preparation compounded in the laboratory of a big, deep-rooted tree, is passing strange. Yet the only difference between the oil of the wintergreen and that of the sweet birch is a slight variation of their boiling points. Well may Newhall ask, "By what alchemy can the little checker-berry vine and a tree—the unrelated black birch—both elaborate from the elements around them the same most pleasant scent and flavor?"

BLUELEAF GREENBRIER

Smilax glauca Walt. [Plate VI]

Cousin alike of the evil-odored carrion flower and the fragrant lily-of-the-valley; sharing its family relationship impartially with the graceful Solomon's seal, the handsome wake robin,

the charming painted trillium, and the dashing tiger lily, the blueleaf greenbrier is a rustic member of the aristocratic lily family, which has its full share of worthy scions as well as its quota of black sheep. It is commonly known by such names as "saw brier," "false sarsaparilla," and "bull bay." Sometimes it is confused with the "cat brier."

The blueleaf greenbrier may be found from Maine to Florida and as far West as Texas. Gregarious in its tastes, it grows in thickets, where it adds much to the impenetrability of the brushy mass. The plant is a persistent climber, with many irregular branchlets, and with tendrils of astonishing strength.

The vine is woody, but usually is armed with slender prickles that make up in sharpness what they lack in sturdiness. In the summer, the leaves are a bluish green with a powdery bloom on their under surfaces. They are beautifully crimsoned by the cold of the late fall. The berries are black, each having two or three seeds.

CORAL BERRY

Symphoricarpus orbiculatus Moench
[Plate VI]

The coral berry is another member of the series pictured here that belongs to the honeysuckle family, in which are included the elder, the viburnums, the snowberry, etc. It is variously known as "Indian currant," "low woodbine," "buck bush," "turkey berry," and "snapberry," and is an erect shrub, growing from two to five feet high, with purple or madder-brown branches, slightly hairy in their younger days.

The region gladdened by the presence of this shrub is bounded by New York and North Dakota on the north and by Georgia and Texas on the south. It is a native of the Mississippi Valley.

With a preference for a normal loam or clayey soil, the coral berry thrives best in some grove-like wood where the rivalries of the undergrowths do not make life too hard a struggle. In the summer the delicate short-stemmed leaves are a soft, neutral gray green. In the fall the bush is transformed; each branchlet, bending beneath its weight of fruit, becomes a wand of delicate red. And as each branch has many spray-like twigs, the whole forms a complex profusion of color, making it deservedly one of America's favorite decorative shrubs.

The Ojibwa Indians call the coral berry "gussigwaka-mesh" and use a decoction of it as a remedy for sore eyes.

BUNCHBERRY

Cornus canadensis (L.) [Plate VI]

This species is the smallest member of the dogwood family, attaining a height of less than a foot. It is an immigrant, a native of Eastern Asia that came as a stowaway to America, where it has spread over a considerable area. Never flaunting itself in profligate profusion in the haunts of men, it is timid as a wild turkey, seeking the cool quiet of damp, deep woods, where it lives a modest life in company with the partridge vine, the golden thread, the fern, and the twin-flower, forming a carpet that matches in color and design the rarest rugs of Kermanshah or Bokhara. The bunchberry is equally at home in Labrador and Alaska, and in New Jersey and California, which broadly mark the four corners of its irregular range.

The leaves appear reasonably early, but its delicate little greenish white flowers, with their four surrounding bracts of white that pass for petals, do not come until May. They usually remain until July, after which the plant, tired of debutante days, settles down to the duty of rearing a family of berries. These begin to appear in August, in compact clusters, dressed in as vivid a scarlet as can be imagined. They are as insipid to taste as they are glorious to sight, so far as man is concerned, but for the birds the berries seem to be "done to a turn" in the kitchen of Nature.

SNOWBERRY

Symphoricarpus albus (L.) Blake
[Plate VII]

The snowberry is a member of the honeysuckle family and is variously known as "snowdrop," "waxberry," "egg-plant," etc.

The snowberry seeks dry limestone ridges and rocky banks. It is a native of North America, but finds a home almost anywhere, spreading across the continent from Quebec to Alaska and from central Pennsylvania to California. The green, short-stemmed, elliptic-oblong leaves are downy underneath. The bell-shaped flowers, which come in May and June, are pink, but so small as to be inconspicuous.

The berries, which are inedible, form in clusters along the slender branches from late June until after early frosts. Their size ranges from that of a pea to that of a marble, as a substitute for which children often use them.

This species is easy to cultivate. It spreads rapidly from suckers. Often it is planted with its cousin, the coral berry, and a fine green dooryard studded with snowberry pearls and coral-berry beads is a sight fair to behold.

LONGSPINE THORN

Cratægus succulenta Schrader
[Plate VII]

This plant, growing as a low shrub in some localities and as a small tree in other regions, has a range extending from Nova Scotia through Quebec and Ontario to Minnesota, and thence southeastward to the mountains of Virginia. It has a preference for rich uplands and limestone soil.

The weapons that give the longspine thorn its name are numerous and grow from 1½ to 3½ inches long. They are slender, shining chestnut-brown spines, almost as sharp as nee-

dles. The flowers appear in May, form in white clusters, calling the insect host with both appeal of beauty and the allurement of fragrance. They have a great many visitors, the bees coming more frequently than the butterflies.

The berries develop in September. They are garnet-colored and translucent, with a shiny, polished appearance. They are not berries, from a scientific standpoint, but belong to the apple type of fruits. They fall off when the frosts become frequent, while the leaves gradually assume that variegated coloring where red and green and yellow are mixed in varying proportions and with gorgeous effect.

Longspine thorns are sometimes used as a stock upon which to graft apples and other pome fruits. They are rapid growers, the shoot of a single year being sufficiently large to serve as a walking stick. The species is one of a large group known as the hawthorns. Prior to 1899 there were about 65 species of hawthorns known, of which some 25 were in North America. At present about 600 species have been described.

AMERICAN HOLLY

Ilex opaca Ait. [Plate VII]

The American holly occurs from Massachusetts to Florida and from Indiana to the Gulf of Mexico, reaching its greatest abundance in the coast regions, its greatest size in Texas, and its greatest beauty in the Carolina mountains. While in Texas and Arkansas holly trees often attain a height of 45 feet and a diameter of four feet, in the North they are rarely more than 10 feet high or more than a few inches in diameter. The holly leaves sometimes hold fast for three years, usually staying until driven off by some ambitious successor. They are stiff, leathery, and spine-tipped.

Few plants are less subject to insect trespassers than the holly, although the leaves are a favorite food of the caterpillar of the pretty azure-blue butterfly (*Polyommatus argiolus*).

The tree usually blooms in May or June, the flowers being small and greenish white in color.

The fruit of the holly is eaten with impunity by birds, though considered poisonous to man. The rare combination of these bright, cheery berries with the shiny green leaves makes the holly much admired. Its beauty, however, is proving, as usual, a somewhat dangerous gift. Unless protected from the axes of the foliage and shrubbery gatherers, there is grave danger that it will disappear in half a century.

The wood of the holly is fine-grained and is employed extensively in cabinet-making, inlay work, and the manufacture of musical instruments. It is also used for engravers' blocks and for rollers for printing cotton goods.

There are about 175 species in the holly group of plants, a dozen or more being found in the United States, including some that bear black berries and others that yield yellow ones.

The holly's use as a decoration is thought to be a survival of the usages of the Roman Saturnalia. It was the custom, before that celebration in commemoration of the blessings of agriculture degenerated into a period of unbridled license, to send a sprig of holly with a gift, as a token of good wishes. The Christian custom of decorating houses at Christmas seems to have come from the pagans. The Council of Bracara forbade such decking of houses with all green things, alleging it to be a pagan observance.

HIGHBUSH CRANBERRY

Viburnum americanum Mill. [Plate VII]

The highbush cranberry belongs to the honeysuckle family and has a fruit of the peach rather than of the berry type.

This shrub grows from three to fourteen feet tall, with smooth stems and gray brown or buff branches. It is a native of Siberia, and in North America has a range reaching from Newfoundland and British Columbia to New Jersey and Iowa, being variously known as the "American guelder rose," the "cranberry tree," etc. It thrives best in upland soils, where the true cranberry cannot live.

The familiar snowball tree is a sterile form of the highbush cranberry.

The flowers of the highbush cranberry appear in May and June and consist of masses of small, white blossoms.

The berries of the fertile plant come in early summer. They remain on the bush all winter, their flavor being too sharp even for the bold appetite of a hungry bird.

THE CHOKEBERRIES

Aronia melanocarpa (Michx.) Britton

Aronia atropurpurea Britton

Aronia arbutifolia (L.) Ell. [Plate VIII]

Botanists are not agreed as to the classification of the black, purple, and red chokeberries shown in plate VIII. Some assign all to a single species; others regard the red as a distinct species and the purple and black as variations of another. Some say all belong to the *sorbus* group of plants, to which the mountain ash belongs, while other include them in the *pyrus* group, to which the berry crabapple and the Japan quince belong.

The berries of all three have the common quality of astringency, their every-day name being a tribute to their power to constrict the throats of those who eat them. They occur in moist thickets and swamps from New England and Minnesota to the Gulf of Mexico, growing from two to six feet high.

The black species is found in altitudes as great as 6,000 feet. Its flowers appear in early summer and its berries in August, shriveling and dropping early. The purple species blossoms from April to June and its berries mature in September. The seasons of the red variety are but little different.

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MANKIND'S BEST FRIEND

Companion of His Solitude, Advance Guard in the Hunt, and Ally of the Trenches

BY ERNEST HAROLD BAYNES

WHEN the intellectual gulf began to widen, in the author's fancy, the man stood on one side and the rest of the animals on the other. The man looked upward at the sky, and all the other animals walked off, each about his own business. "All," did I say? All but one! The little dog sat on the very edge of the widening gulf, ears cocked, tail moving, and watching the man. Then he rose to his feet, trembling. "I want to go to him," he whined, and crouched as if to leap.

The pig grunted and went on rooting in the ground; the sheep nibbled a tussock of grass; the cow chewed her cud in calm indifference. It was none of their business whether he went or stayed.

"Don't try *that* jump," said the friendly horse; "you can't possibly make it; I couldn't do that myself."

"Oh, let him try it," sneered the cat; "he'll break his silly neck and serve him right."

But the dog heard none of them; his eyes were on the man, and he danced on the edge of the gulf and yelped. And the man heard him and looked across and saw what he wished to do.

"Come!" shouted the man.

"I'm coming," yelped the dog.

And then he gathered himself and leaped. But the gulf was very wide—almost too wide for a little dog. Only his brave forepaws struck the farther edge of the chasm, and there he hung without a whimper, looking straight into the eyes of the man. And then there came to the man a strange feeling he had never had before, and he smiled, stooped and lifted the dog firmly and placed him by his side, where he has been ever since. And this was the very beginning of the movement which, ages later, led to the foundation of the first humane society. And the dog went frantic with joy and gratitude, pledged his loyalty to the man, and he has never broken his pledge.

THE BEGINNINGS OF THE FRIENDSHIP BETWEEN DOGS AND MEN

The dog is the oldest friend man has among the animals—very much the oldest. Compared with him the cat and the horse are new acquaintances. Probably we shall never know when the friendship began, but the bones of dogs lying side by side with the bones of primitive men tend to show that it was in very, very remote times.

And perhaps in the beginning of their acquaintanceship they were not friends; probably not. Probably primitive man

British official photograph, from Associated Illustration Agencies, Ltd.

MESSENGER DOGS BILLETED BEHIND THE FRONT-LINE TRENCHES

"Quarters fit for a dog rather than a human being" once was an opprobrious description; but many an infantryman in the world war would have felt as "comfy as a king" if his rest billet had been as clean, as dry, and as sanitary as these kennels, where messenger dogs were tended with the greatest care in order that they might be in perfect physical condition when called upon to carry a message, upon the delivery of which might depend the success of an offensive (see pages 201, 239, and 257).

had to fight the wild dogs as he doubtless had to fight all the other wild animals he came in contact with.

And no mean foes would these wild dogs prove themselves. Their speed, strength, courage, and ferocity, coupled with their probable habit of fighting in packs, must have made them very formidable enemies to unarmed men, no matter how strong the latter may have been. Doubtless in those early days the encounters would often end in favor of the dogs, and the man would go down and be torn to pieces by the overwhelming pack.

But the man had two arms and prehensile fingers and toes, and so could climb trees which the dogs could not, and probably he often escaped his canine enemies in this way. We can imagine him, out of breath and badly bitten, perhaps, sitting up in a tree gazing fearfully at the leaping dogs below, and wondering when he would be able to descend to get some food.

Perhaps it was while sitting thus that some great prehistoric genius conceived the idea that by means of a branch broken from the tree he sat in he could strike the dogs without descending to the ground. And perhaps he carried out this idea, drove the dogs away yelping, and the next day leaped into fame as the inventor of the club, the original "big stick."

HOW THE DOG'S RESPECT FOR MAN GREW

And somewhat later, when the dogs had learned to dodge the blows of the club, to snatch it out of the hands of the man, perhaps, we can believe that another great genius came along and proved that by

British official photograph, by Associated Illustration Agencies, Ltd.

A CANINE COURIER OF THE GREAT WAR

This dog as a dispatch-bearer is three and a third times as efficient as a man, for in three minutes it will deliver to local headquarters the message being written by the officer, whereas a human courier would require ten minutes to make the trip. Only one man is allowed to feed this dog—its keeper at headquarters. Soldiers are not allowed to pet the animal, as its affection for its keeper must be undivided.

means of a stone, skilfully hurled, dogs could be killed before they were near enough to bite. And here began the art of throwing missiles at an enemy, which has culminated in the invention of great guns which hurl projectiles for 60 miles.

Under such convincing tutelage, no doubt the dogs gradually came to have a great and healthy respect for man, the one mysterious creature who could fight them with something more formidable than his teeth and claws, and while they were still at a distance, where they could not use their own. Perhaps there came to be a mutual respect. Both of these powerful races were largely carnivorous and hunted for a living.

Sometimes when the man was hunting, probably the dogs would follow at a respectful distance, and when he had made his kill with a club or a stone, or later with a spear, they would clean up the parts of the carcass which he did not carry off.

Sometimes perhaps the dogs would run down and bring to bay some dangerous quarry which would have been too fleet for the man, and while they were circling about trying to avoid the death which was sure to come to some of them before the rest could break their fast, the man would come up and with his crude weapons kill their enemy, take what he needed for his own use, and yet leave them an ample feast. And because they were useful to one another in this way, we can easily imagine that the man and the dog would gradually form a sort of partnership in the chase.

Again, when man lived in caves he was doubtless an untidy, not to say filthy, creature, who after feeding would toss

Photograph by Associated Illustration Agencies, Ltd.

A PHIDIPPIDES OF MODERN WARFARE

Like the famous Greek athlete who ran from Athens to Sparta to summon aid in the repulse of Persian invaders, this dog scurries over shell holes and mined areas, wriggles through barbed wire, and braves an artillery barrage to carry a vital message to headquarters when telephone wires have been shot away and communicating trenches have been made impassable for men (see pages 201 and 257).

the bones and other refuse just outside his home, until the place looked like the outside of a fox burrow when the hunting is good.

Wild dogs when they had been unsuccessful in the chase, perhaps, and consequently hungry, would be attracted by the odor of this waste food and would come and carry it off. They would come furtively at first, but as they found they were not molested they would come boldly, and by thus disposing of refuse that would otherwise become offensive even to primitive man they performed a service in exchange for benefits received.

In this way man would become used to, and would even encourage the presence of, dogs in the vicinity of his home.

Then, with so many wild dogs living near by, it is certain that occasionally their dens would be found by the man and the puppies carried home to amuse the children. Such puppies would grow up with little fear of their human hosts, and by their playful, friendly ways would probably win for themselves at least tolerance, if not actual affection, and dogs would become a recognized part of the household.

The puppies of these dogs would be a little tamer than their parents, and those of the next generation a little tamer still, until some of them became so domesticated as to have no thought of ever returning to the wild state.

SHARING MAN'S COMFORTS

When fire was invented or discovered, no doubt such dogs shared with man its comforts and its protection, and this may have strengthened their determination to throw in their lot with the mysterious beings who could create such comfort and protection for them.

Official photograph taken on the British front in France

"TAKING HIS MESSAGE TO GARCIA"

While the soldier in the world war was actuated by motives of patriotism, the mainspring of the dog's service in the great conflict was dauntless fidelity to its master. Neither hazards of terrain nor of battle could stop the dumb courier when bearing a message from the front-line trenches to the keeper in the rear. The illustration shows a British war messenger dog in the front area swimming across a canal to reach his master and deliver a message.

Sooner or later man would discover that certain individual dogs were swifter or stronger than their fellows and therefore more useful in the hunt. These would be encouraged to accompany him; the others would be left at home. The less useful dogs would gradually be eliminated—driven away from the home or killed—and the swifter, stronger dogs retained. We can imagine that this process of weeding out might continue until a distinct breed of hunting dogs was developed.

As dogs were required for other purposes—for guarding property, or even for household pets—other qualities might be encouraged and other breeds evolved.

The varieties produced in different regions would be likely to differ from one another partly by reason of the difference in the wild forms from which they sprang, partly because of the difference in the lines along which they were developed.

In the inevitable intercourse between peoples from different regions there would surely be an exchange of dogs, accidental or otherwise, and the result would be new varieties which in the course of ages and under widely varying conditions, including finally selective breeding, might eventually produce the many widely differing breeds we see today.

THE ANCESTORS OF OUR DOMESTIC DOG

Have you ever been to a dog show? I mean a big one like the Westminster Kennel Club show in New York, with 3,000 dogs on the benches and over a hundred different breeds represented? If you have, perhaps you have been impressed, as I have been, with the marvelous variety of forms to be seen.

FRENCH WAR DOG: A COURSER WHOSE WINGED FEET SPURN THE EARTH

A remarkable "flight" picture of one of the liaison couriers trained and used by the French for emergencies when the telephone system in the front-line trenches was put out of commission by enemy artillery (see pages 201, 239, and 257).

Let us recall for a moment some of the dogs we have noticed and see how widely they differ in appearance. For instance, compare a giant Saint Bernard, weighing between 250 and 300 pounds, with a tiny Chihuahua, which may barely tip the scales at a pound and a half and which can stand on the outstretched hand of a lady. Or look at the tall, lithe wolfhounds and greyhounds, built to move like the winds of heaven, and then turn toward the short-legged, crooked-jointed bassets and dachshund, and you will surely smile and probably laugh out loud.

Compare a Newfoundland or, better still, an Eskimo dog, whose thick, dense coat can withstand even the rigors of an Arctic winter, with a hairless dog of Mexico or Africa, which looks cold even in the middle of summer.

And we note that such striking comparisons can be made not only in the general appearance of the dogs, but in almost every feature of them. We see ears that stand straight up like those of the German shepherd, ears that fall forward at the tips, like those of the collie, and ears long and pendulous, like those of the bloodhound, which extend far beyond the tip of the nose and sometimes touch the ground when the animal is on the trail.

These and the endless other comparisons of the many different breeds may make us hesitate to accept the conclusion which naturalists, led by Darwin, have arrived at, namely, that all domestic dogs are descended from a few wild forms, namely, wolves, jackals, and possibly dingos (page 194). Yet it seems that the naturalists are correct in their conclusions, and that the many varieties found at the bench show are but so many proofs of what Maeterlinck, and Cuvier before him, point out, namely, that the dog is the one animal which can follow man all over the earth and adapt himself to every cli-

mate and to every use to which his master chooses to put him.

THE DOG DOES NOT BOAST OF THE FOX ON HIS FAMILY TREE

For a long time it was thought that foxes should be included among the ancestors of the dog. They are very dog-like in general appearance and in many of their habits.

I have had many American red foxes in captivity, and one which I reared from a puppy became almost as tame as a dog. He followed me on my walks and had the run of the house. Foxes of this species whine, yelp, and bark, and, like dogs and wolves, smile and wag their tails when pleased, bury food which they cannot eat at the time, and turn round and round on their beds before lying down. But in spite of these similarities, and in spite of the fact that they will sometimes make friends with domesticated dogs, and even with wolves, it seems that they are not closely related to either.

As far as I am aware, no one has ever succeeded in obtaining a cross between a fox and a dog. The late Mr. A. D. Bartlett, for years superintendent of the Zoölogical Gardens in London, after a long series of experiments and observations, not only failed to procure a cross himself, but states that he never heard of a single well-authenticated case of such a cross having been made.

WOLVES, JACKALS, DINGOS, AND DOGS INTERBREED

On the other hand, wolves, jackals, and dingos cross freely with domestic dogs and the progeny is fertile. I have myself seen many crosses between American timber wolves and dogs. Some shown me by Superintendent Benson, of Norumbega Park, near Boston, some years ago, were the offspring of a great Dane dog and a female wolf. They were finely built, high-strung, very wolfish-looking dogs, the characteristics of the wild parent distinctly predominating.

In Kansas I once saw two well-grown puppies whose mother was a coyote and father an unknown dog. One was grayish, somewhat like the mother; the other was black. They had wolfish heads and snarled like coyotes. They were very nervous and at every opportunity ran away from me with their tails between their legs.

Both the American gray wolf and the smaller prairie wolf, or coyote, are easy to domesticate, though it has been my experience that they never become quite as tame and tractable as domestic dogs.

I had one coyote, which we named Romulus, for six years, and a good part of the time he was loose. He followed my wife and me on our tramps through the woods and over the mountains, sometimes at heel, sometimes ranging out in front. He would come at a call, and if within hearing would respond instantly to an imitation of the long-drawn howl of the coyote.

A PLAYFUL, AFFECTIONATE COYOTE

He was very affectionate and would smile and wag his tail to express his joy at meeting us, and throw himself on his back as an invitation to us to caress him. He was playful, too, and given one end of a rope or strap would do his best to pull it away from us. While in this playful mood he would catch up the skirt of a coat or dress and walk along with us, proudly smiling and wagging his tail. But he was very high-strung and nervous, and if we attempted to hold him in the presence of strangers he would bite and get away as quickly as possible. Once loose he was no longer afraid and would often run right in and tear the stranger's clothing.

Most writers refer to the coyote as cowardly, but I have seen nothing which seems to justify this estimate of his character. He simply isn't foolhardy. He's like the Irishman who said he preferred to have his enemies call him a coward today to having his friends say "How natural he looks" tomorrow.

I will give an example of what I mean. One bitter winter day I was tramping on snow-shoes through a New Hampshire forest with a coyote at my heels. As we were passing a deserted cabin, three fox-hounds which had taken refuge from the recent storm came leaping out in full cry.

The coyote, outnumbered and taken by surprise, drifted away over the snow like a puff of gray smoke, the hounds in pur-

Photograph by William Henry

A COLLIE OF ROYAL ANCESTRY BECAME THE MASCOT OF AMERICAN SOLDIERS

Before he "joined the army," this dog of blooded lineage bore the name of "Bum." Now he answers to the more appropriate title of "Bullets."

suit. But they were no match for him in speed, and after floundering along in his wake for less than half a mile they stopped, turned round, and started back.

The coyote, who had been running easily only a few feet ahead of them, seemed to be completely in touch with the situation. No sooner had the tired dogs turned than he wheeled about, pitched into the rear guard of the enemy, and in a running counter attack decisively whipped all three of the hounds and finally drove them back yelping into the old house from which they had come.

That didn't look like cowardice; it looked like good generalship. And it isn't cowardice for an animal the size of a coyote to run away from an animal the size of a man, especially when the little wolf knows that in some mysterious manner his enemy can kill him when he is still a quarter of a mile away. That's a com-

bination of common sense and good judgment.

THE FIDELITY OF ROMULUS

My coyote, Romulus, was very destructive to poultry, and even to the wild deer, and I finally gave him to a zoölogical garden, where he died six years later, at the age of twelve.

I made a point of going to see him once or twice a year, and he never forgot me. As soon as he saw me he would begin to execute a strange little rocking dance, meanwhile smiling and waving his brush. The keeper would unlock the door of his pen, and as I entered the wolf would rush to greet me and roll over on his back like a friendly puppy. Then he would throw himself upon me, lap my face and hands, hang onto my clothing as though to detain me, and when finally I had to leave him, he would raise his muzzle in the air and howl disconsolately.

A DOG AND HIS MASTER PROTECTED ALIKE FROM POISON GAS AT THE BATTLE FRONT (SEE PAGE 239)

Every living creature—man, dog, horse, and mule—had to be equipped with a gas mask in order to pass through the areas deluged with poisonous fumes during the world war. In the background are seen stretcher-bearers carrying a wounded man to safety. The war dogs were frequently employed in finding the sorely wounded in No Man's Land and in leading rescuers to them.

My experience with domesticated timber wolves would tend to show that they are not so demonstratively affectionate as the coyotes. As puppies, they are rather playful, but as they get older they are apt to take themselves very seriously.

They differ greatly in character. Some I have had became so savage that it was necessary to get rid of them; others were gentle and friendly as long as they lived.

One big, powerful wolf I owned sometimes showed marked affection for me, but it was only occasionally, and then only when we were entirely alone. The presence of a third person made him grimly aloof. Nevertheless, he did not resent the friendly advances even of strangers, and when I took him with me on lecture trips, as I often did, he would follow me through the audience, and the smallest child present might put its arms about his neck without fear of being hurt. But he simply tolerated these ad-

vances; he never responded to them with so much as a smile.

He was not so tolerant of dogs, however, and woe to any dog that ventured to cross his path. As a joke I once entered him as a "buffalo hound" at one of the big bench shows. He was accepted, benched, and behaved himself perfectly, though I did take the precaution to put a wire screen between him and the public.

Only once did he even threaten trouble. That was when I was leading him past a bench of the Russian wolf hounds, who instantly leaped to the ends of their chains, eyes blazing, teeth bared, while their savage barking brought every dog in the show to its feet.

The great wolf whirled about facing the foremost dog, Champion Bistri o' Valley Farm. The calmness of the wild brute was in marked contrast to the excitement of the dogs. As he stood there firmly on his four legs, the hair on his back and neck rising in a tall mane, menacing fangs unsheathed, and those cold, merciless eyes gazing straight into the face of his sworn enemy, I wondered what was going on in the back of that big gray head. Perhaps he was wondering how many dogs of that caliber he could account for in a fair open fight, taking one at a time. Then I dragged him off, mane tossing and with many a backward glance at the splendid dogs who were just as eager as he was to come to grips.

Jackals, which in many respects resemble our own coyotes, are found in Asia and Africa. If taken as puppies they are easily tamed. My father, who lived for many years in India, had a tame jackal which showed many doglike traits. It would wag its tail when pleased, and throw itself upon its back in affectionate submission.

THE WILD DOG OF AUSTRALIA

The dingo is the wild dog of Australia and may have been one of the ancestors of our domestic breeds. There is still some doubt about this, however, as it is not quite certain whether the animal originated in Australia or whether it is descended from the dogs of Asia and was introduced by man at some very remote time. In any case, it is a true dog and is easily tamed.

The native name for the animal is "warrigal," "dingo" being the name given by the natives to any domesticated dog of the settlers. The dingos I have seen were tawny brown in color and about the size of a smooth-coated collie, but of more stocky build and more powerful jaws. I once had a dingo puppy, a lovable ball of soft rich brown fur, but alas! he died before I had a chance to study him.

In the wild state dingos hunt in packs, and formerly were so destructive to sheep that the stockmen began a war of extermination, aided by a government bounty of five shillings for every dingo killed. Strychnine was the principal weapon used, and it was so effective that the ranks of the wild dog were thinned to a point where they were no longer a menace.

TRAINING THE DINGO

On the Herbert River the natives find dingo puppies and bring them up with the children. A puppy is usually reared with great care; he is well fed on meat and fruit and often becomes an important member of the family. His keen scent makes him very useful in trailing game, and his fleetness of foot frequently enables him to run it down. His master never strikes him, though he sometimes threatens to do so.

The threats often end in extravagant caresses. And he seems to respond to this kindly treatment, for the dingo is said to be a "one-man" dog, refusing to follow any one but his master. Nevertheless, the call of the wild, especially in the mating season, often proves too strong for him, and he will rejoin the pack never to return to his human friends.

When we consider, then, the doglike friendliness of which these wild forms are capable, even in the first generation, it is not difficult to believe that they are the ancestors of our domestic dogs, with which they freely interbreed.

Our belief is still further strengthened if we consider how closely many of the domesticated dogs resemble the wild forms of the same regions. The resem-

WEARING THE CHEVRONS OF HONOR FOR SERVICE OVERSEAS

A ship's mascot is as truly essential in the maintenance of morale among bluejackets as are clean quarters, good food, and strict discipline. These tiny tykes, with their blankets bearing service stripes, are important units of the United States battleship *Oklahoma's* complement of fighters.

blance is nowhere stronger than in the Eskimo dogs of Greenland and Alaska, which are believed to be simply domesticated wolves. Some of the Arctic explorers have called attention to the difficulty of distinguishing them from the wild wolves of the same region.

Captain Parry, in the journal of his second voyage, speaks of a pack of 13 wolves which came boldly within a few yards of his ship, *The Fury*, but which he and his men dared not shoot, because they could not be quite sure that they were not shooting sledge dogs and thus doing the Eskimos an irreparable injury.

A few years ago Admiral Peary kindly conducted me over Flag Island, in Casco Bay, that I might see the pure-bred North Greenland Eskimo dogs which he brought back after his discovery of the North Pole. When these animals carried their tails curled over their backs, as they usually do, there was no mistaking them for anything else but dogs, but the moment they lowered their tails, as they often did, to all appearances they were gray wolves.

Another striking example of this similarity between Eskimo dogs and wolves is shown in a photograph by Donald B.

MacMillan of one of his female Eskimo dogs, standing with lowered tail watching a litter of puppies which she is nursing. The puppies, which are spotted, are evidently not pure breed, but the mother looks as much like a timber wolf as any timber wolf I ever saw.

In the same way some of the dogs which in former years were found among the Indians farther south closely resembled coyotes.

Many of the pariah dogs of India look much like the wolves of that country; in southeastern Europe and the south of Asia many of the breeds of dogs bear a close resemblance to the jackals of the same districts, and some of the South American dogs show a marked similarity to the small South American wolves. It was such considerations which led Darwin to the following conclusion:

"It is highly probable that the domestic dogs of the world are descended from two well-defined species of wolf, namely, *Canis lupus* and *Canis latrans*, and from two or three doubtful species, namely, the European, Indian, and North African wolves; from at least one or two South American canine species; from several races or species of jackals, and perhaps from one or more extinct species."

HISTORICAL SKETCH

As we have noted, there is good evidence that men and dogs were associated in very remote times. Among the remains left by the ancient cave-dwellers, half-petrified bones, some human, some canine, are found lying together. Remnants of dog bones have been found in the Danish "kitchen-middens"—heaps of household rubbish piled by the people of the newer Stone Age—and dog bones of later periods have also been found in Denmark.

Of course, it is often impossible to form any idea of the appearance of these dogs in life; but in Switzerland there have been found records which show that a large dog differing widely from the wolf and the jackal, and which is said to have borne a resemblance to our hounds and setters, was at least partially domesticated by the lake-dwellers.

That the men of the so-called Reindeer period had dogs which they used in the chase, and perhaps for other purposes, is evidenced by the crude pictures which they cut in the rocks to record their mighty deeds and adventures.

One such picture, 5 feet high by 12 feet long, cut thousands of years ago in the solid quartz at Bohusläu, on the shores of the Cattegat, depicts what seems to be a hunting party consisting of men, dogs, and horses, just landed from a boat and engaged in the pursuit of reindeer.

Other prehistoric artists have engraved rude figures of dogs on the surface of bones and horns; and these, no doubt, were aboriginal dogs. In fact, with the exception of a few islands, namely, the West Indies, Madagascar, some of the islands of the Malay Archipelago, New Zealand, and the Polynesian Islands, there are few parts of the world where we cannot find evidence that the dog in some form existed as an aboriginal animal.

THE DOG DOMESTICATED IN EARLY TIMES

In most parts of the world the dog has been more or less domesticated from very early times, though it is not until we begin to study the records of such highly civilized peoples as the ancient Assyrians and Egyptians that we find dogs which we can recognize as belonging to distinct breeds.

The Assyrians had at least two, the greyhound and the mastiff, the former much like our coursing dogs, the latter a large, heavy-built, powerful beast, but evidently much more active than the mastiffs seen in modern kennels and at the bench shows.

In the Nimrod Gallery of the British Museum may be seen a bas-relief tablet showing Assur-bani-pal and his attendants with Assyrian mastiffs straining at the leash, and another showing similar mastiffs hunting wild horses.

The ancient Egyptians seem to have been at least as familiar with dogs as we are, and on the Egyptian monuments of 5,000 years ago are figured several widely differing breeds, showing that even in those days dogs were used not only in the chase, but as companions and household pets.

DOGS OF THE CHASE 2,500 YEARS AGO

Among the ruins of Nineveh have been found marble slabs upon which are carved such scenes as this, which shows attendants with nets holding the leashes of the hunting dogs of Assur-bani-pal, the *grand monarque* of Assyria, magnificent patron of art and literature and creator of the great library of Nineveh. This panel proves that the hunting dogs of twenty-five centuries ago were much the same as those of today.

Photograph by Paul Thompson

AT THE DOG SHOW: THE SMALLEST AND THE LARGEST EXHIBITS

The astonishing differences in the various species of the dog family are strikingly depicted in this picture. Wonderful Tiny, the Yorkshire terrier, in his mistress' hands, weighs only 10 ounces, while Boy Blue, the great St. Bernard, weighs 250 pounds.

Some of the Egyptian greyhounds bore a striking resemblance to modern English greyhounds. Others had fringed tails and had doubtless been introduced from Persia, where this breed, unchanged in form, is used today (see page 206). Another hound kept by the Egyptians was not unlike our great Dane, and there was a short-legged toy dog which carried its tail curled over its back. It is interesting to note that one kind of hunting dog kept by the ancient Egyptians was called "unśu," or "unśau," meaning "wolves," perhaps indicating a knowledge of its descent from the wild form.

WORSHIPED BY THE EGYPTIANS

But to the Egyptians dogs were much more than either assistants in the chase or household pets. They were objects of veneration and worship. They appear in the friezes of the temples and were regarded as divine emblems.

Herodotus tells us that when a dog belonging to an Egyptian family died, the members of the household shaved themselves as an expression of their grief, and adds that this was the custom in his own day.

An interesting explanation of this veneration associated it with the annual overflowing of the Nile. The coming of the great event, on which depended the prosperity of Lower Egypt, was heralded by the star Syrius, which appeared above the horizon at this time. And as soon as this star was seen the inhabitants began to remove their flocks to the higher pastures, leaving the lower ones to be fertilized by the rising waters. The warning was so timely and unfailing that the people called Syrius the "dog star," because it seemed to show the friendly watchfulness and fidelity of a dog.

A feeling of gratitude for this service was no doubt gradually replaced by the stronger feeling of veneration and worship. The dog came to be regarded as a god—the genius of the river—and was represented with the body of a man and the head of a dog. As Anubis, it became a great figure in Egyptian mythology, and its image was placed on the gates of the temples.

At a later period Cynopolis, the city of the dog, was built in honor of Anubis, to whom priests celebrated great festivals and sacrificed earthly dogs—black ones and white ones alternately. These dogs, and others of a reddish color, were embalmed, and many dog mummies have been found.

EGYPTIAN DOG WORSHIP SPREAD TO OTHER LANDS

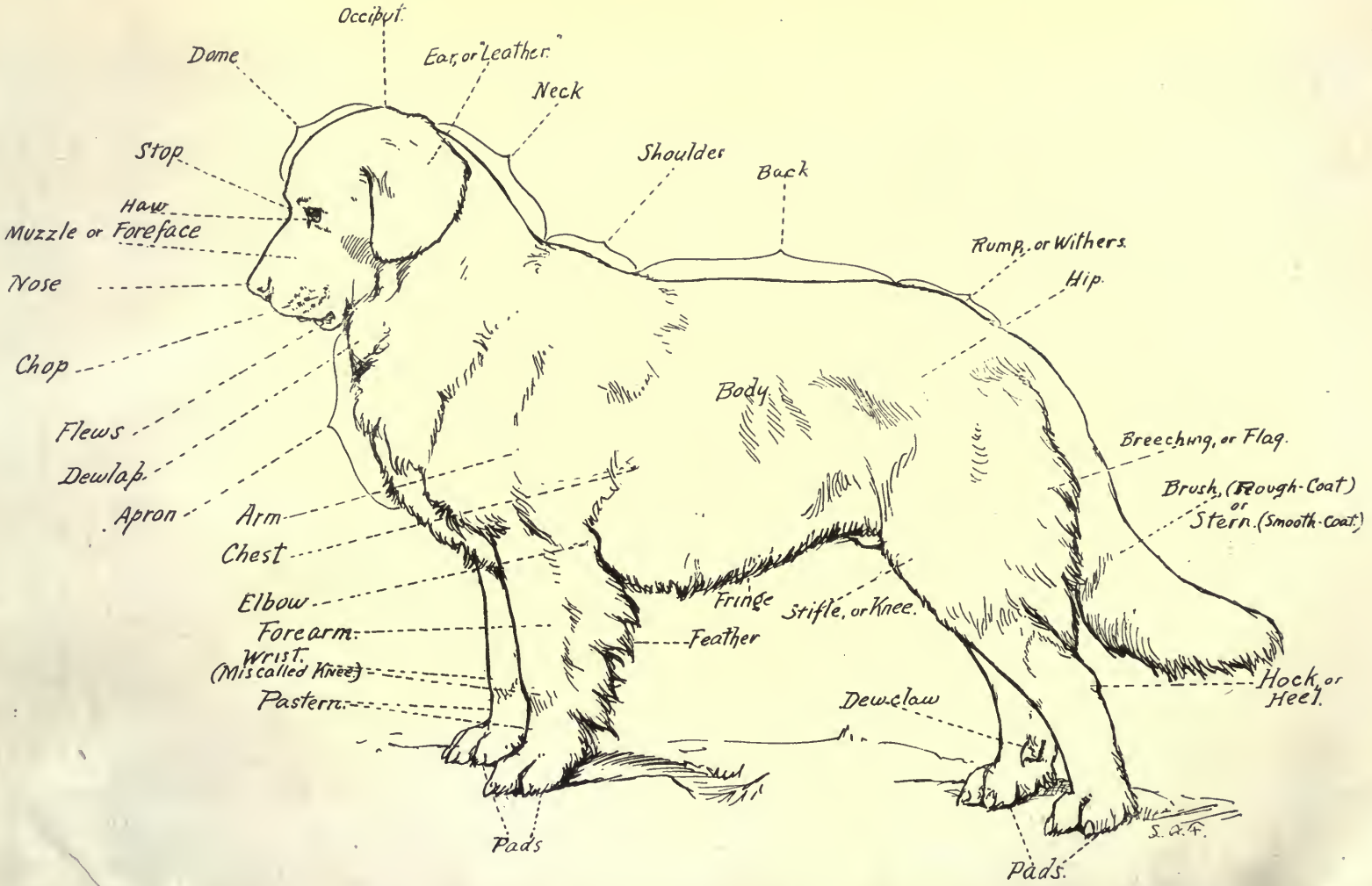
Dog worship spread from Egypt to many other countries, where it took different forms. The Romans sacrificed dogs to Anubis, to the lesser dog star, Procyon, and to Pan, and the Greeks made similar offerings to propitiate Proserpine, Mars, Hecate, and other imaginary beings of whom they stood in fear.

Plutarch says: "The circle which touches and separates the two hemispheres, and which on account of this division has received the name of horizon, is called Anubis. It is represented under the form of a dog because this animal watches during the day and during the night."

Out of this idea it seems there arose two mythical personages—Mercury, or Hermes, and Cerberus, the three-headed dog supposed to guard the gates of hell.

But there were humbugs even in those days, and they humbugged the dog worshipers even as charlatans often humbug Christians today. Perhaps the limit of deception was practiced on a certain nation in Ethiopia, which is said to have been bamboozled into actually setting up a dog for its king. Clad in royal robes and with a crown upon his head, he sat upon his throne and received the homage of his subjects. He signified his approval by wagging his tail and his disapproval by barking. He conferred honors upon a person by licking his hand, and a growl might condemn a man to captivity or death.

Even so, since he was a dog, his subjects might have expected justice and possibly mercy had it not been for the "advisers" by whom he was surrounded. These gentlemen, of course, had their own interests to serve, and no doubt served them by skilfully juggling the interpretations of the "king's" commands.



Line drawing by Louis Agassiz Fuertes

AN OUTLINE CHART OF A DOG, USING THE NEWFOUNDLAND AS A SUBJECT

This drawing shows all the anatomical parts of the dog as commonly used in descriptions and criticism of points.

WORK OF DOGS IN THE WAR

It would not be fair to close this article without brief mention of the splendid work performed by dogs on the battle-fields of Europe.

From the very beginning of the war, dogs have had a paw in it. When the Germans invaded Belgium the harness dogs, which up to that time had been used for hauling milk, vegetables, and other produce, began to assist the refugees in getting their children and household goods out of the invaded territory. Since then they have hauled light artillery, and carts laden with blankets, bread, hay, and scores of other things for the comfort of soldiers and their horses.

They have done sentry duty in the trenches and, with their masters, patrol duty out on No Man's Land, their acute senses often making them aware of the approach of an enemy long before an unassisted man could have detected it.

They have carried dispatches through barb-wire entanglements and amid the hail of bullets, and in neat baskets strapped to their backs have delivered homing pigeons intended to carry messages for longer distances.

But perhaps the greatest service they have rendered has been in connection with the Red Cross, especially in the French and German armies. A part of their work has been to find the wounded after a battle.

It is well known that when a man is wounded, usually one of his first thoughts is to get out of the way of the bullets and the shells, and if he has strength he will crawl to some comparatively safe place, often a place where it would be difficult for a man to find him, especially at night. Later, perhaps, he will be too weak to crawl out again or even to cry for help, and in many cases he would be lost if it were not for the dogs.

Keen of scent, these animals are not dependent on eyesight or hearing, and one of them will probably find him. If it does it will take his cap or something else belonging to him and hurry back to the lines and presently return with stretcher-bearers, who will carry the poor fellow in to receive the best attention possible.

Other dogs, each with a big can of hot soup strapped to either side, are sent through the front-line trenches to carry this cheering fare to the fighting men.

Many of the dogs have been mentioned in the dispatches, a number have been decorated for bravery or distinguished service, and many, many more have done their bit, the biggest bit it is possible to do, and gone without a whimper where the best men and the best dogs go.

OUR COMMON DOGS

By Louis Agassiz Fuertes and Ernest Harold Baynes

With Illustrations by Louis Agassiz Fuertes

THE dog is a species without known beginning, and of all man's dependent animals the most variable in size, form, coat, and color. Furthermore, no breed as we now know can be considered a species, as any dog may breed with any other and produce fertile offspring, which in itself is the very definition of a species.

The great plasticity of the present-day dog is due, of course, to this fact, and no other one of man's domestic animals (excepting possibly chickens) presents the range of possibility and the readiness with which new "varieties" may be produced and stabilized. Thus, up to 1885 the well-known and justly popular Airedale was a nondescript and variable terrier of the lowly poacher—simply a clever, faithful, and dependable mongrel. Today no breed demands a more exacting set of requirements nor meets them so generally!

The illustrator's problem in preparing

TIMBER WOLF and COYOTE

DINGO

NORWEGIAN ELKHOUND

OTTER HOUND

this series was not the production of a "standard of perfection" of the various "breeds" of dogs. It was to give, as far as possible, the proper appearance of acceptable types that have been dignified by a name, and to show in what way they are entitled to the friendship and care and companionship of man. Let it not be thought that it was an easy task, nor that had time, opportunity, early concentration, and a larger acquaintance with the field been part of the artist's equipment, the result would not have been far more satisfactory to the reader and to him.*

It these pictures it has been less his notion to establish types and a pictorial standard than to show the "man on the street" the general appearance and the special reason for being of the seventy-odd "kinds" of dogs that seemed to the editor and the artist best included in such an exposition as this. There are, of course, other recognized varieties of dogs, but those shown are the kinds best known.

*Outstanding among the many helps in the preparation of this series are the names of many men and women who entered early into the coöperative spirit of the times and gave essential aid where it was much needed. Man is a fickle animal, and as the natural consequence of this trait many loves of earlier days languish and fade as newer beauties meet his eye. Thus it was impossible to get modern material on such dogs as the Newfoundland and pug, no longer extensively bred, as their day of grace is done. For these reference was freely made to books, chief among which were Leighton's "Book of the Dog" and Watson's "Dog Book" (first 2 vol. ed.) to "Field and Fancy," and to the illustrated supplements to 'Our Dogs," published in England.

To his "contributing collaborators" the artist desires gratefully to acknowledge the help of Messrs. Skinner and Lewis, of "Field and Fancy," and of Mr. A. R. Rost for information, material, and kindly criticism; Messrs. Harry W. Smith, Miss Amy Bonham, Mrs. Henry Sampson, Jr., Mrs. C. H. Yates, Mrs. Haley Fisk, Mr. A. J. Davis, Mr. R. M. Barker, Mr A. K. Easton, Mr Jacob Rupert, Jr., Major B. F. Throop, Mr. F. Gualdo Ford, Mr. E. Kilburn-Scott, Miss Ruth Nicholls, the Mepal Kennels, and others for the generosity with which they supplied photographs and other material bearing on the dogs in which each is particularly interested.

Indeed, should the artist specifically acknowledge each one who has contributed his share in the work, it would, he fears, occupy more space than does the finished article!

THE WOLVES AND COYOTES

(For illustration, see page 202)

The timber, or gray, wolf, which undoubtedly has an influence in the formation of the native Indian and Eskimo dogs of this country, formerly occupied practically all of the northern continent of America. He is a large, strong animal, attaining a weight of probably well over 100 pounds. His main points of difference from "true" dogs are the woolly brush and the small, obliquely set eyes.

In form he is close counterpart of such dogs as the German shepherd (see page 232). His coat is harsh and quite long, especially on the neck, throat, shoulders, and hind quarters. In color he ranges from nearly pure white in the Arctic to black in Florida and the more humid regions. The average color is grizzled gray and buff.

The coyote is extremely similar in color, following the changes, geographically, which characterize his big and burly cousin. In weight the coyote seldom goes over 60 pounds, and an average would probably be under 40. He is much more fox-like in general appearance, having relatively as well as actually a more slender muzzle and even bushier tail. His gait is an easy, shadow-like trot until scared or in hot pursuit, when he flattens out and simply flies over the ground.†

DINGO

(For illustration, see page 202)

Several fine dingos have been kept in various zoölogical gardens in this country, those in Washington being especially typical and well conditioned. The dingo is the most doglike of any of the wild members of the canine group, and the fact that they interbreed freely and produce regularly fertile progeny is further evidence of its proximity to the dogs of mankind.

He is a medium-sized animal, weighing 60 to 80 pounds, possessing all the dog's traits of character and of physique. He has a broad head, moderate-pointed ears, strong, well-boned legs, and a deep chest, which fit him for the long chase. His one wolfy characteristic is the quite bushy tail, which is about half-way between what a dog of similar coat would carry and the brush of a wolf.

Dingos untinctured by dog blood are self-colored red or tawny and are very fine-looking animals. They are said to be readily tamable, and those the artist has known were as tame and companionable as any dog. They would come to the bars of their inclosure, ears back and tails wagging, and lick the hand of their keeper, and did the same for the artist if the keeper was present. Never having tried to

† For a more detailed description of wolves and coyotes, see E. W. Nelson's "Wild Animals of North America," with illustrations in color from paintings by Louis Agassiz Fuertes, published by the National Geographic Society.

force friendship nor made advances when alone, it is impossible for the writer to say how catholic their tolerance was (see also page 194).

THE NORWEGIAN ELKHOUND

(For illustration, see page 203)

The Norwegian elkhound is one of the wolfy-looking dogs from which the shepherd dogs of middle Europe (see pp. 232 and 239) have been evolved, and is probably a more dependable dog than any of them, having been bred for the specific uses of hunting big game, and left free of the refinements and stultifications demanded by the more effete market, which is largely dependent on the whims of wealth and caprice.

The elkhound, in short, looks like a small, stocky, wide-faced German shepherd dog, standing about 22 inches instead of 26 or 27, but wearing the same strong, rough working coat of grizzled buff and brown, or wolf colors. He is a rare dog in the United States, but in northern Europe plays an important part in the life of the people of the mountainous and wooded country.

He is used to some extent as a carrying and draft animal, but is unsurpassed in the rough and tumble of the hunt for such big game as bear, wolves, and elk (the "moose" of northern Europe), and is so keen of nose and so tractable that he can easily be trained to the more subtle arts of hunting the capercailzie and black grouse.

The only one the artist ever saw was the single specimen shown in the Westminster show of 1918, and no dog in the whole show made him more envious of his owner. For what Mark Twain characterized as "the purposes of a dog" this strong, friendly, and primitive-looking animal seemed a most perfect creature. He was alert, bright, and self-reliant, but willing to extend a reserved welcome to a new acquaintance.

PERSIAN GAZELLEHOUND, OR SLUGHI

(For illustration, see page 206)

This ancient race is one of the most peculiar, most beautiful, and most puzzling of dogs. His graven image comes to us as one of the earliest of man's essays in art, and is so easily recognizable that there is no doubt possible as to the archaic artist's model. Possibly no dog known has changed less from our earliest knowledge of it to the present day.

The first peculiarity to strike the eye is the curious combination of short, close body hair, with silky, flowing Afghan fleece on the ears and long silken feather from the stern. Otherwise he looks at first glance very like a greyhound.

But, unlike other coursing dogs, the slughi is short and straight in the body, though very long and rangy of leg. As he stands in profile the outline of fore legs, back, hind leg, and ground form an almost perfect square.

A fact tending to show the antiquity of the slughi is that no combination of known dogs seems to be capable of producing a creature just like him.

In color they are almost without limit. Cream, fawn, "hound" colors—that is, black, with tan chops, legs, belly, and feather—seem to predominate, and while pictures are rather rare and the dogs practically non-existent outside the Mediterranean regions of Africa and upper India, we have never seen any that were irregularly pied with white, as are most dogs.

This argues a very dominant character for their ancient ancestors, for this symmetry of coloring, found in all wild animals, is about the first superficial characteristic to disappear under domestication; and when it persists, as in this instance, through countless generations, we may be sure of a very persistent and dominant character for the original wild stock.

The gazellehound is about the size of a medium greyhound—26 to 28 inches at the shoulder. The falcon is sometimes used to harry the game until the dogs come up with it.

THE OTTERHOUND

(For illustration, see page 203)

It is said that every sizable stream in Great Britain has its otter. To hunt this elusive and wily animal, a very distinct type of dog has been evolved. The requirements of the hunt demand the keenest of noses, the staunchest of "wills to hunt," the utmost courage, and the ability to stand the roughest of wet and dry coursing.

These qualities have been assembled in the otterhound, which may be described as a bloodhound clad in the roughest of deerhound coats. In general he is all hound, with long, sweeping ears, deep jaw, and deep-set eye showing the haw. He is broader in the brow than the bloodhound and not quite so large, but he has the same fine carriage, on straight, strong, and heavily boned legs; large, sound, and partly webbed feet. The hair over the eyes is long and ragged, and there is a strong tendency toward beard and moustache.

He is a great favorite in Great Britain, but is rarely seen in America. In color he may be "hound colors," or "self-colored," fawn, brown, tawny, or black. The working dogs are so hardened by rough work that they are not particularly suitable as house dogs; when reared to it, however, their fine qualities render them exceptional companions even for children.

THE GREYHOUND

(For illustration, see page 211)

Developed originally for great speed in the pursuit of antelope, gazelles, and desert hares, the greyhound, though one of the most ancient, is also one of the most extreme types of dog known to man.

SCOTTISH DEERHOUND

PERSIAN GAZELLE HOUND

IRISH WOLFHOUND

Very slender and fine of line, he still maintains great strength, and his lovely "compensating" curves and streamlines of form present a wonderful example of the beauty that inevitably accompanies a perfectly adapted mechanism His motion is supremely graceful and easy, and in repose his elegance does not diminish.

This is a tall dog, measuring from 28 to 31 inches at shoulder and weighing from 60 to 70 pounds. The hair is short and close, revealing intimately the wonderful surface muscles. The slender legs have sufficient bone for strength, and the arched back is well muscled, though slender. The sloping shoulders allow for a long forward reach in the spring, and the chest, while rather narrow, is immensely deep, with ribs fairly sprung, giving sufficient capacity.

The head, while slender, has considerable strength of jaw, and the eye is bright and responsive. While not as intelligent as some dogs, the greyhound is by no means stupid. His finely chiseled head, delicate ears, and arched neck give him a distinctive and well-born appearance equaled by few dogs.

The Italian greyhound is simply a diminutive greyhound. In both any color is permissible.

As we look to the ancient Greeks for the highest development of the human body, so we look to the great hunting dogs of ancient lineage for the highest development of canine grace. These tall, powerful hounds, trained for ages to match their speed and strength against fleet and often savage wild creatures, have attained that beauty found only in those things which are perfectly adapted to the purposes for which they are used.

Swiftest and most graceful of all, perhaps, is the English greyhound. Built, it would seem, of spring steel and whipcord, and with a short satin coat which offers no resistance to the wind, this swallow among dogs cleaves the air and barely touches the ground he flies over. Even the fleet English hare is no match for him in speed, and were it not that the hare has a clever knack of dodging at the moment the dog is about to overtake her, she would be quickly caught.

General Roger D. Williams, of Lexington, Kentucky, who has done a great deal of wolf-hunting in the West, states that greyhounds can not only overtake a timber wolf, but will close with him instantly, regardless of consequences, which is more than some wolfhounds will do.

WHIPPET

(For illustration, see page 263)

A small and very swift breed of greyhound called the whippet has been developed in England, and whippet racing is an old and favorite sport among English workingmen, particularly in the northern and northwestern counties. The dogs are raced over a 200-yard straightaway course, and are usually handicapped according to weight and previous performance.

There are two men to each dog—the handler, who holds the animal's fore paws on the mark, and the "runner-up," usually the owner or some other person of whom the dog is fond and toward whom he runs. The starter, pistol in hand, stands behind the "scratch."

The owners now run away from the dogs, each waving a rag and shouting, "Hi! Hi!" to attract his favorite's attention, and, still urging the dogs, take their position behind the "overmark," which is 10 yards beyond the winning post. Each handler holds his dog's neck with the left hand, and with the right grasps the root of the tail. At a word from the starter, the handler gets ready by lifting his whippet's hind feet well off the ground, while its fore feet remain on the mark.

At the crack of the pistol the dog is literally thrown into its stride, and with the other competitors flashes down the track, crosses the winning mark at top speed, slowing up only as it approaches its owner, who is still frantically calling and waving the rag.

Each dog wears a colored ribbon about his neck—red, white, blue, yellow, green, or black—and at the finish of each heat a flag the color of the winner's ribbon is hoisted by the judges to announce the result. The distance has been covered in 11½ seconds, or an average of 52 feet 2 inches per second for the 200 yards.

Color is not a point in whippets, their sole purpose being to go as fast as possible. They come in all colors, like greyhounds; indeed, they are judged along exactly parallel lines. If anything, they are even more extreme in their peculiarities of form, being very roached up in the back and clear of limb. The ideal weight is about 15 pounds for males and 13 for females. The head shows usually some Manchester terrier tendencies, and the tail has generally longer hair along its under side than covers the rest of the dog.

In spite of the fact that these slight little dogs are rather delicate and trembly, they are staunchly declared by those who own them to be very bright, affectionate, and loyal.

As is generally the case, when "the fancy" takes hold of a utility breed an artificial standard, based almost entirely on looks, supersedes the more erratic standard, based upon performance. The English foundryman would pay more for a snipy, knobly little dog that could run like a scared spirit than for the most graceful and cleanly silhouetted beauty at the bench show, should it lack in speed and racing courage.

SCOTTISH DEERHOUND

(For illustration, see page 206)

There is something about the shaggy hunting dogs of Britain that makes a particular appeal to those who are attracted to dogs. It may be the touching contrast of their harsh coat and rugged body with the soft, affectionate look in the almost hidden eye. It may be the knowledge of the indomitable courage and immunity from fear that is latent in the friendly creature that noses our palm and meets our advances

with such amiable readiness. Whatever its causes, these brave and friendly dogs, such favorites with Landseer and Burns, have surely maintained their enviable position in our regard.

In the United States they are seldom seen, as only a few have been introduced and little done to establish the breed here. This is unfortunate, though easy to understand, as our laws do not permit the hunting of antlered game with dogs, and our carnivorous big game demands dogs of a heavier and more aggressive nature than these fleet chasers of the Highland stag.

In appearance the deerhound is much like a harsh-coated, grizzled greyhound, and is an undersized counterpart of the great Irish wolfhound, standing from 26 to 29 or 30 inches. They are self-colored, the dark blue grays being perhaps the favorites. Cream, fawn, sandy brown, and both light and dark brindles are perhaps more frequently seen. Any large amount of white is a fault, as it indicates a foreign strain, even though the dog be fine in other respects.

The Scottish deerhound might well be described as a powerfully built, rough-coated greyhound. While not as swift as his English cousin, he has speed enough for most purposes and strength and stamina, which made him a valued partner in the chase before the days of the modern rifle.

In olden times the possession of a fine deerhound was a matter of sufficient consequence for tribes to go to war about. In a battle between the Picts and Scots over one of these dogs more than 160 men were killed.

The deerhound makes a wonderful companion. His honest, dark hazel eyes, looking straight out from under their shaggy brows, quiet but fearless, bespeak the rugged beauty of his soul and gain at once our admiration and our confidence.

IRISH WOLFHOUND

(For illustration, see page 207)

While not so heavy as the St. Bernard, the Irish wolfhound is considerably taller, and easily outclasses all the other big dogs for size and bulk, reaching the extreme height at the shoulder of 36 inches. A big Dane with his feet on a man's shoulder looks about level into his master's eyes; a wolfhound towers head and shoulders over even a tall man in the same position.

The picture gives a concrete idea of how this dog should look. His immense size and shaggy, grizzled coat add greatly to his impressiveness. And, combined with these, this fine dog possesses that rare union of great courage and bravery with a gentle and affectionate disposition. He was used as a guardian against wolves by the Irish shepherds of old. One can hardly imagine a more effective animal for this purpose.

There are some who think the Irish wolfhound an even better dog than the Scottish deerhound. If he is, it must be because there is more of him; for, barring the fact that he is of rather more massive build, he is practically a gigantic deerhound.

Though of very ancient lineage and one of the great dramatic figures of canine history, he would probably have been lost to us if it had not been for the untiring efforts of Captain G. A. Graham, of Dursley, England. With the disappearance of the last wolf in Ireland, this great hound's chief occupation was gone, and the breed as such was neglected until about sixty years ago, when there were but a few degenerate specimens bearing the distinguished name of Irish wolfhound.

But Captain Graham did not hold the rather general belief that this breed had become extinct. He was of the opinion that after the extermination of the Irish wolves the large dog used to hunt them became reduced in size and strength to conform to the lighter work required of it—that of hunting deer—and that it was now represented by the deerhound. So he bought a few specimens, still bearing the original name, and by carefully cross-breeding with the deerhound and great Dane, and later with the Russian wolfhound and some other large breeds, has produced a giant hound closely corresponding to the best descriptions and the best drawings of the favorite dog of the Irish kings.

Like the deerhound, this great wolf dog has a friendly, intelligent face, which, with his physical ability to accomplish about anything which he undertakes to do, wins respect and confidence at the first glance.

The Irish wolfhound figures in many legends, the best known perhaps being that of Gelert, who has given his name to the Welsh village *Beth Gelert* (the grave of Gelert). The hound was presented to Llewelyn the Great, King of Wales, by King John of England in 1205.

The story goes that one day, the dog having left him in the field, Llewelyn returned from the chase in an angry mood. When he reached his castle, Gelert, covered with blood, rushed out from the chamber of his little son to greet him. The king entered and found the bed overturned and stained with gore. He called to the boy, but there was no answer, and rashly concluding that the dog had killed him he plunged his sword into Gelert's body.

A further search revealed the child sleeping unharmed beneath the overturned bed and beside it the dead body of a huge wolf, which had been killed by the gallant hound. It is said that remorse led Llewelyn to build a chapel in memory of Gelert and to erect a tombstone over his grave. At any rate the chapel and the tombstone are there to this day.

All colors are permissible except part colored; all pure-bred dogs of this breed, however, come naturally "whole" or "self" colored, and blotches of irregular white showing foreign blood are almost invariably accompanied by other conspicuous defects.

In build the Irish wolfhound should be slenderer than the Dane and more sturdy than the greyhound. He should be strong and straight

RUSSIAN WOLFHOUND

GREYHOUNDS

of limb, fairly heavy in bone, but not "leggy"; the hair should be straight, rough to the touch, and in no sense woolly or silky. The best dogs have conspicuous eyebrows and beard. There should be no dewlap nor throatiness, as this is an active working breed, which should be always in good fighting trim.

BORZOI, OR RUSSIAN WOLFHOUND

(For illustration, see page 210)

Those who proclaim the Russian wolfhound, or borzoi, the most wonderful dog in the world have strong grounds for their opinion. Of great size, a marvelous silky coat not long enough to hide his graceful lines, speed almost equal to a greyhound's, strength almost equal to that of an Irish wolf dog, and with long, muscular jaws, like a grizzly-bear trap, it is no wonder that he is such a favorite, and that beautiful women are so proud of his company.

But the gods always withhold something even from those whom they favor most, and the borzois we have seen appeared to lack both the keen intelligence and the frank expression characteristic of their British cousins.

We know that the champions of the breed will differ from us in this, but the fact remains that the form of the Russian dog's head leaves little room for brains.

In Russia these hounds are used in wolf-hunting. The wolves are first driven out of the woods by smaller dogs or by beaters, and when a wolf comes into the open two or three borzois, well matched as to speed and courage, are unleashed and sent after him.

They are trained to seize the wolf, one on each side, just behind the ears, and they should do this both at the same moment, so that their antagonist cannot use his formidable teeth on either of them. They hold their quarry until the huntsman arrives, leaps from his horse, and either dispatches the wolf with a knife or muzzles him and carries him off to be used in training young dogs in a large, railed inclosure made on purpose.

This handsome animal should be of extreme slenderness of head, leg, and waist; narrow through the shoulders, but very deep in the chest. Pasterns and hocks well let down, and, like the greyhound and whippet, the borzoi should have the back strongly arched or roached to give play to the enormous unbending spring. The legs are straighter than in the greyhound, especially at the stifle.

Color is not a cardinal feature, as in Russia at least the borzoi is really *used* for wolf-hunting and the color is unimportant. Here and in England, however, where they are kept solely for their graceful beauty, those in which white predominates, with head and flank markings of lemon, bay, brown, or black, are favorites.

The head should be extremely slender and narrow, the coat deep, silky, and nearly straight, the eyes full and round. Indeed, the eyes of the best dogs look rather flat and scared to one who sees them for the first time. In spite of his slender, rather obsequious, appearance, the borzoi is a serious opponent when in trouble.

Woolly hair, bent pasterns, straight back, "cow hocks," and a gaily carried tail are all defects to be avoided.

GREAT DANE

(For illustration, see page 222)

Not quite so swift as the greyhound, deerhound, or wolfhound, the great Dane is more powerful than any of them and fast enough to overtake most things that run. At his best he is a huge dog, built on greyhound lines, but much more massive.

This is probably one of the very oldest breeds, and has been used for ages in hunting all kinds of wild animals. In Germany this dog is still used for hunting the wild boar, but in most places he is now regarded as a companion and a guardian of property.

The great Dane is a typical German dog, and is in fact a synonym of "Deutsche Dogge," by which name he is known throughout central Europe.

Like all oversized dogs, the Dane is given to many weaknesses, both of body and of disposition. The perfect Dane is a most statuesque and magnificent animal; the ordinary one is indeed an ordinary dog. Very seldom, and for an exorbitant price, we may get a dog that lives up to the standard, with strong, straight legs and back, massive deep head, strong, close feet, and, most essential of all, even and trustworthy temper. Far more often, though, promising puppies grow up to be saggy in the back, cow-hocked behind, and rabbit-footed in front, and while elephantinely playful as 100-pound pups, surly and really dangerous as grown dogs. When properly housed, restrained, and exercised, they are splendid creatures.

But often they outgrow the capacity of their owners to care for them, when they become the bane of the neighborhood; for the truth is they are too big and too dangerous to be allowed unhampered freedom, and the fright they cause, even in play, among people unacquainted with their ways, renders them frequently very unwelcome adjuncts to a neighborhood. In addition to their power and size, they have a rather excitable and impatient disposition, which unfits them at once as children's playmates.

There are few things which have such a healthful moral effect upon a criminal as to find a big, resolute great Dane standing squarely across his path. If the criminal is a judge of dogs, he may read in the grim face a look which says, "You shall not pass," and if he isn't a fool, he'll "go while the going is good."

A few years ago a burglar in Missouri met a Dane in this way, and either failed to read the danger sign or thought the dog was bluffing. He was strangled to death in front of the window by which he was attempting to enter the house, and the verdict for the dog was "justifiable homicide."

When one walks down the street with a great Dane, about half the people one meets refer to him as a bloodhound. This mistake is largely due to the fact that the managers of the numerous "Uncle Tom's Cabin" shows traveling about the country usually select great Danes instead of bloodhounds as the dogs required in the play. They do this because the Danes are much bigger and more spectacular, and therefore attract more attention when led through the streets of a town before the performance. They also are easily excited into the spirit of the act, whereas the kind, sentimental, and heavy bloodhounds would walk through the part without the slightest thrill to themselves or to the palpitating audience.

THE BLOODHOUND

(For illustration, see page 214)

The bloodhound is a dog of only medium size and, in spite of his name and reputation, is gentle and affectionate.

According to some authorities, these dogs were brought to England by William the Conqueror; according to others, they were brought by pilgrims from the Holy Land.

They are often spoken of as "black St. Huberts," but there were white ones and red ones also, and it is quite possible that our modern bloodhounds are a blend of the three. They probably derive their name from the fact that originally they were used to track animals which were wounded and bleeding, though they have long been associated chiefly with the tracking of men, and for the last hundred years or more, particularly with the trailing of criminals.

The English bloodhound is simply the extreme development of those characteristics which typify the hound: long, low-hung ears, loose skin, long muzzle, and somber expression find in him their greatest degree of perfection.

In fact, the skin of the head and face is so loose and ample that it falls into deep folds and wrinkles; the weight of the ears pulls it into furrows, and the lower eyelid falls away from the eye, disclosing a deep haw. The ears, of thin, fine leather, are so long as to trail when the nose is down.

The head is well domed, the occipital point is very prominent, the flews and dewlap reach excessive development, only equaled in the St. Bernard.

The bloodhound should stand 23 to 27 inches and weigh from 80 to 95 or 100 pounds. He should be black and tan, in strict conformity with the standard as shown in the picture, or all deep tan. The more primitive coloring, the black and tan, is generally preferred. The tail is not carried quite so gaily as in the case of foxhounds and beagles. Any appreciable amount of white betrays impurity of strain. In disposition he is the gentlest of gentle hounds, though his rather fearsome name has earned him an unjust notoriety with those who do not know much about dogs.

Only a few kennels breed bloodhounds now. They are used by police departments, both in this country and in Europe, and if brought to the scene of a crime within a few hours after it has been committed, and if the criminal fled across ground not too much trampled over by other people, they can render valuable assistance by leading the police directly to the man they are seeking.

There have been bloodhounds credited with following a trail thirty hours after it was made, but such performances must be made under ideal conditions and are very rare, to say the least.

FOXHOUNDS

(For illustration, see page 218)

The English foxhound for more than 300 years has been one of the principal factors in the great English sport of fox-hunting. Perhaps no other single sport has done so much to mold the national character. The dogs in packs follow the fox across country, and the fox-hunters, under the direction of a "master of foxhounds," ride after them.

The fine qualities developed by hard riding, by facing all kinds of weather, and by the dangers incident to jumping high fences and wide ditches, coupled with the sportsmanly behavior which constitutes the etiquette of the hunting field, were just the traits required to make gallant soldiers and successful colonists.

The English foxhound, while of ancient lineage and highly standardized in England, has not been found to meet exactly the requirements of the rougher sport in this country. Thus, through the efforts of a few assiduous fox-hunters, there has been produced a somewhat rangier, lighter, and more courageous dog, known as the American foxhound.

The lighter built and more speedy American foxhound is used either in packs, followed by mounted hunters, as in England, or singly, or in couples, to drive the fox within range of a gun.

The development of this breed has been largely due to the initiative and energy of a few men, notably Mr. Harry W. Smith, of Worcester, Massachusetts, in the North, and Brigadier General Roger D. Williams, of Lexington, Kentucky, in the South.

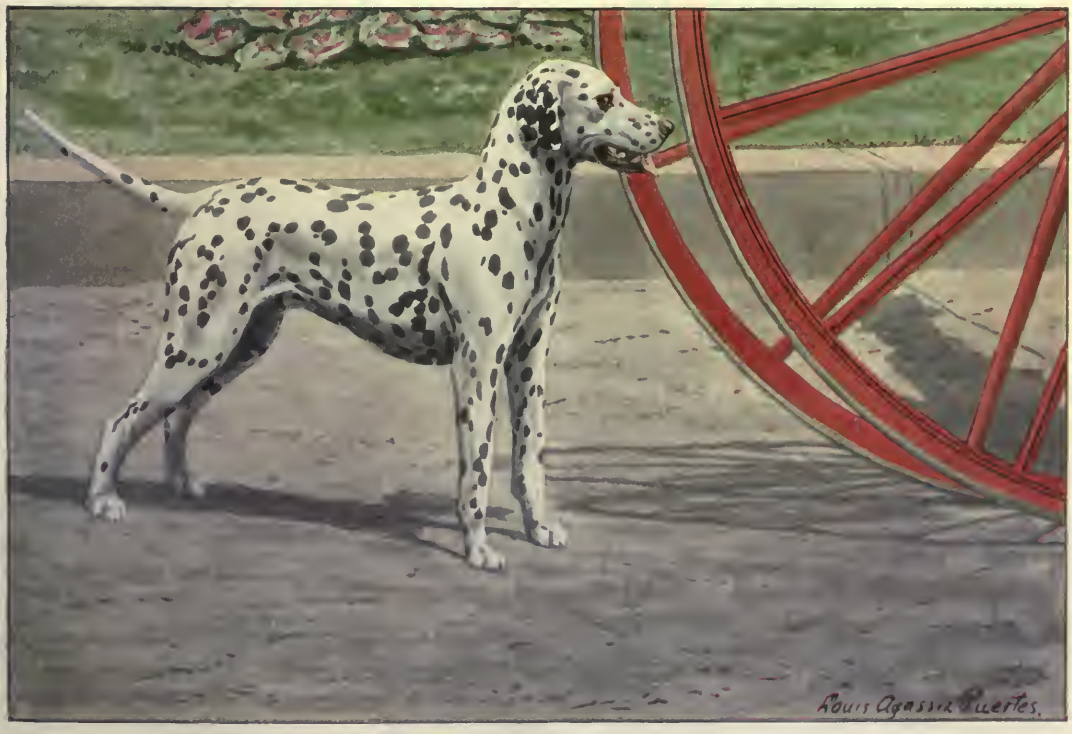
In essentials the American and English breeds are, of course, very similar. The English dog is a little squarer and more pointer-like in the head, with shorter ears and straighter, longer legs. Our dog seems more like a hound to us, with its fuller leather and more elastic pastern and hock and stifle. The English dog looks rather stiff and stilty in comparison, though undoubtedly just what the Englishman wants. And surely the English huntsman knows just exactly what he wants.

The hound is a very primitive type of dog, and one of the proofs of this is his unvarying and rigid adherence to his pattern of color. White, of course, is not natural, but the result

BLOODHOUNDS

BEAGLE BASSET

POINTER



DALMATIAN

of ages of domestication, and may occur anywhere on a dog, as partial albinism, without regard to symmetry or rule.

It will be found, however, that through all the ages *nothing* has been able to upset the fundamental pattern on all the hound-like dogs, which we see preserved in its purity in the black and tan bloodhound. White may supplant it anywhere, but if there is color it will *invariably* fall according to this design. Thus beagles, foxhounds, and many other dogs with hound blood in them will without exception have their black marks in the proper area for black to come, and their tan marks likewise, whether they come in large patches or as ticks or flecks of color in a white ground.

The drawings show the main characteristics of the two types, as well as their markings.

THE BEAGLE

(For illustration, see page 214)

The beagle is not over 15 inches high. He must not be bandy-legged like the dachshund, nor long and low in the body, these qualities being reserved for the basset. He should be an active, intelligent, well proportioned, and capable little dog, with plenty of tenacity of purpose, though great speed is not to be expected. The ears, while long, do not in any way equal those of the bloodhound or basset, reaching just to the tip of the nose.

He must have no terrier traits, either physical or temperamental, nor any throaty tendency nor flews. The expression is just like that of a very alert foxhound. The legs must be strong and straight, the stifle well let down, and the hock fairly well bent, and the feet strong and close, with full, hard pads. Any hound colors are correct—that is, black saddle and neck, with tan legs, hips, shoulders, and head, interrupted anywhere by white.

They carry a gay stern, and are in every way very engaging, safe, companionable little dogs. Like all hounds, they make friends easily, and are therefore more easily led astray than some dogs, particularly when young.

Harriers resemble foxhounds, but are somewhat smaller, and, as the name implies, are kept for hunting hares. They are not used in this country, but in England they are hunted in packs as in fox-hunting, the hunters following on horseback.

The beagle and basset are smaller hounds, used chiefly for hunting hares and rabbits, and are usually followed on foot. There are smooth-coated and rough-coated varieties of both breeds.

BASSET

(For illustration, see page 214)

The basset, which is little known in this country, was imported into England from France between fifty and sixty years ago. It was a popular sporting dog in Germany and Russia also at that time. With its keen scent, extremely short legs, and very slow movements, it was well equipped for finding game in dense cover. The face of the rough basset is often very wistful; it is one of the most beautiful canine faces I know.

The basset is doubtless a compound of the old long-eared hound and the dachshund. Indeed, the type is exactly described if we picture a small bloodhound set on a dachshund's legs, and further words become unnecessary, except to say that the breed "comes" in two forms—smooth or hound-coated and rough or terrier-coated.

The latter has never, I think, and the former but seldom, been introduced into this country, where the more active (though possibly more erratic) beagle has so firm a hold. In Europe it is used as a rabbit dog, being low enough to enter the warren. Here, where the rabbits do not dig, but live on the surface, the lively beagle is more useful than his slow, sedate, and steady congener. Any "hound color" is correct.

THE POINTER

(For illustration, see page 215)

So far we have spoken of dogs which when used for hunting purposes are usually supposed to catch and kill the game which they follow. We now come to a class of hunting dogs which are not expected to kill the game, but to help their masters to kill it, or to retrieve it after it has been killed.

In the very front ranks stand the pointer and the setters—English, Irish, and Gordon—and which is the best is largely a matter of individual taste.

The chief duty of each is to scent out the game (usually such birds as partridge, grouse, and quail), and, when near enough, point out to the gunner the spot where it lies concealed. As the hunter approaches, the birds rise and are shot on the wing. Very often the dogs are trained to pick up and bring in the game after it is shot.

The pointer, as the illustration shows, is smooth coated, and his name suggests his business.

This most popular of upland hunting-dogs has undergone many changes in standard as to size, conformation, and color. But certainly no "strain" has been more successful, nor stamped its virtues more generally upon following generations of pointers, than the famous "graphic" pointers of 20 years ago, and it is one of the best of these that was used as a model.

The working pointer should be a lean, hard-limbed, and well-muscled dog of about 60 pounds weight, though 10 pounds either way would meet the preferences of different fanciers. He *must* be keen of eye and nose, obedient, teachable, and staunch. Many otherwise fine pointers lack the courage of their convictions, and it is easy to spoil a good dog either by too gentle or too rough handling.

Colors are legion; white should predominate,

with liver, lemon, or black distributed in almost any fashion, according to taste. No finer upland bird-dog exists, and his endurance and energy are things to marvel at.

As in all working dogs, the "tools of his trade" must be right. Soft, spready feet, weak legs or back, small or "snipy" nose are all vital defects. The head is shaped very like that of a setter, but should be wider across the ears. A good, square profile is essential, with a well-defined stop. The tail, strong and full at the base, should taper rapidly and be as straight as possible.

The breed is so popular and so widely used that there is little difficulty in getting well-balanced pointers.

The continental "pointing griffon" is a type of growing popularity, with little to commend it above the better-known field-dogs except its novelty. It may be described as a wire-haired pointer, whose coat is rough and quite long, particularly over the eyes and on the muzzle. It has a terrier-like expression that is rather prejudicial to the impression it makes upon one familiar with the frank, loyal look of a setter or pointer.

DALMATIAN, OR COACH DOG

(For illustration, see page 215)

The Dalmatian was originally a "pointer" and in his native country was used for sporting purposes. But in England he was found to be very inferior to the native pointer, and, as he showed a marked fondness for horses and stables, he was specially trained as a "coach" or "carriage" dog.

For more than a hundred years before the day of the automobile, it was a common thing on English roads to see one of these muscular, deep-lunged, spotted dogs trotting easily between the hind wheels of a fashionable "turn-out"—so close, in fact, that it had the appearance of "weaving" in and out as the horses' heels flew back. The automobile has virtually done away with it as a vehicle guardian and companion; still its unusual appearance has been sufficient to maintain it among the fancy and a goodly number find their way to the big shows.

The coach dog strongly resembles a small, straight-legged pointer in general conformation, and differs chiefly in the shorter ear, straight front, and less arched stifle.

In color it must be white, evenly spangled all over with round, clearly defined spots of black or dark brown. Black is preferable and more usual. These spots must be sharp, and the more even and uniformly distributed the better. They may be confluent on the ears—it is a virtue to have dark ears—but elsewhere on the body it is a fault. In size they should be from half an inch to an inch in diameter, roughly.

The legs should be strong and straight, of good bone, for speed and endurance. The feet should not be large, but compact, and with toes well arched and pads deep and elastic.

The coach dog should be from 19 to 23 inches high and weigh from 35 to 50 pounds.

SETTERS

(For illustration, see page 219)

Setters have long but "flat" silky coats and plumed tails, and as a rule very gentle faces, full of expression. In olden times, when it was customary to "net" game, these dogs were taught to point the birds and then to crouch or "set," that the net might be thrown over and beyond them; hence the name.

The English, Irish, and Gordon setters are almost too well known to need any physical description. Fashions have changed somewhat, and will probably continue to do so, in these as in other popular breeds.

Still, the needs are so definite, and performance is such a necessary foundation for appearance, that the setters will probably never deviate very widely from the present standard, except in minor points attained by crossing the known types. It is doubtful if any serious breeder would trust other than setter blood in these already very beautiful and useful dogs.

In this country no dog is so well fitted for hunting grouse, pheasants, quail, and feathered upland and woodland game in general.

In comparing the three principal types, the English is the largest and strongest, and is largely white, with liver, tan, orange, or black blotches and "ticking." The Irish is the lightest and most finely drawn, and is all rich mahogany tan; he has a more high-strung disposition than either of the others, and is rather more nervous and subject to temperamental weaknesses, though when well trained and intelligently handled is unsurpassed as a field and hunting dog.

The Gordon is a north British development, to be used chiefly on the red grouse of the heathery uplands, and is black, with deep tan chops, ear-linings, chest, belly, feet, and feather, and the characteristic tan spots over the eyes and on the cheeks. For several years he was bred to a very delicate, slender-headed type; he was then a very affectionate and beautiful creature, but lacked the staunchness such a hunting dog must have. The present standard dictates a dog of almost exactly the conformation of the English setter: wide across the forehead, strong, fairly broad, and very deep in the chest, with plentiful bone in legs and good, hard, compact feet.

In this country, where the autumn woods abound in russet browns and deep shadows, the solid red and the black and tan dogs are harder to follow with the eye than those with a fair amount of white; hence the English setter and the mainly white pointer are favorites among the hunters, though the Irish has many adherents among those desiring a beautiful and companionable dog. The Gordon is nearly obsolete in this country.

The English has been modified in several respects, and excellent types have come to be

ENGLISH FOXHOUND AMERICAN FOXHOUND

GORDON SETTER IRISH SETTER ENGLISH SETTER

known by the kennel names of their breeders, such as Belton and Llewellyn setters. These are excellent quail-dogs, being somewhat more of the build of the Irish setter and considerably lighter and more delicately put together than the staunch old English setter. Both are white, with much fine ticking of black which in the long white coat has a bluish appearance.

All setters should show quite a marked stop, have full, sympathetic, and intelligent eyes, soft, fine, nearly straight hair, a full feather along the back of all four legs, as well as from the lower side of the tail.

They should be built much like a pointer, except that they lack the springy arched quality of legs and back, being rather more careful, but much less rapid, workers than these rangers of the open fields. The stifle should be straight from front or back instead of free and outturned.

Under his soft and rather silky coat, the setter should be hard, finely muscled, and compact, and none of these dogs should be allowed to get fat and lazy, as they so often become in the hands of affectionate owners. No dog has a more wheedling way with him, and it takes a rather firm nature to withstand his wiles.

RETRIEVER

(For illustration, see page 223)

Many breeds of dogs have been trained to find and bring in game which has been shot, but retrievers, as their name implies, are bred specially for that purpose. English sportsmen had for some time been experimenting with different breeds in an effort to find a dog exactly suited for retrieving game, when, about the middle of the last century, there was introduced from Labrador a hardy, black-coated, small-eared, medium-sized dog, which seemed to answer the purpose. He was a typical water dog and not subject to ear canker, which so often develops in spaniels used to retrieve waterfowl.

This Labrador dog, crossed probably with the English setter, and perhaps with other breeds, produced the retriever, which may be either black or liver brown.

In size about like a pointer, covered all over with a coat of tight, curly hair, Astrakhan-like, except for his smooth head and face, he is a curious-looking dog. He is a capable and teachable creature, however, and makes a capital assistant in the duck-blind or as a gun-dog, where birds are the quarry.

The curly retriever may be either coal black or dark liver brown. He should weigh about 65 to 80 pounds.

There is also a smooth retriever, which is much like the curly in form and size, but has straight hair.

The Labrador retriever is shorter of leg than the other types and generally more solidly built. It is generally some shade of brown, and none of the retrievers should show more than a trace of white on the chest. All have smaller ears than the pointer or setter, and the curly type carries his close to the head.

The original "Labrador," or something very like, still exists under the same name, as a distinct and recognized breed. He has all the good qualities of both of these highly intelligent parents.

CHESAPEAKE RETRIEVER

(For illustration, see page 223)

This is an essentially American dog and has come to a high state of perfection along the eastern seaboard, and, as an introduced type, is much esteemed in the ducking marshes of the Northwest. His parentage is supposed to be chiefly otterhound and Labrador, but it is altogether probable that other blood runs in his veins, as he is one of the dogs that has been developed for a particular use through particular qualities his ancestors were found in actual practice to possess. The result is a very curious, very excellent, but not very stable nor beautiful dog.

But no known dog is such an unswervable retriever or can stand a fraction of the exposure to icy wind and icy water which this hardy fowling dog seems to revel in. To meet this rigorous demand, he has a curious, deep woolly undercoat that seems never to wet through, such as we find on water-dwelling mammals like the otter; this is protected and covered by a harsh, strong coat of regular hair, straight or slightly curly, from which one good shake drives practically all the water. They will chase a wounded duck over or under the ice and will follow the liveliest "cripple" till it wearies. In open deep-water duck hunting such a dog is invaluable.

They vary from 60 to 80 pounds in weight and from 22 to 25 inches in height. The ear is quite short and set rather high, giving a squarer look to the head than in the setter, which it remotely resembles. They are tawny brown or "sedge color" generally, though other less desirable colors are met with occasionally.

THE IRISH WATER SPANIEL

(For illustration, see page 223)

Identified more or less with the retrievers, because they perform similar duties, are the sporting spaniels, which, because they are divided into so many branches, constitute perhaps the largest dog family in the world.

The English "Kennel Club" recognizes Irish water spaniels, water spaniels other than Irish, Clumber spaniels, Sussex spaniels, field spaniels, English springers, Welsh springers, and cocker spaniels. They are all used to assist the gunner to find his game and to retrieve it after it is shot.

The Irish water spaniel is in a class by himself. You need to see him but once to remember him forever. It is said that he was the very last dog to be made, and that it was only

by using the remnants of half a dozen other breeds that enough material was found of which to make him.

When he comes up to you for the first time, you'll probably laugh at him; but don't laugh too long; there'll be tears in your eyes if you do. For this quaint creature who looks as if he had borrowed from friends everything he has on, including his tail, has such an honest face, such a charming expression, and such a dignity of manner that he'll win your sympathy and your respect before the first smile of amusement has left your face. As a water dog, he is generally regarded as superior to any other member of his family, though most spaniels take kindly to the water.

Formerly quite a popularly known dog for sniping and ducking, the old Irish water spaniel seems to have been almost entirely abandoned, and few are now seen in this country. Perhaps the uses to which he was put are more satisfactorily met by the setters and retrievers, both of which are stronger and heavier and can equal him in work in the water.

The type of this breed should weigh about 50 pounds and be of a uniform liver-color. The coat is quite long and tightly curled, but by no means woolly. It is long on the crown, but the face, front of hind legs, and most of the tail should be clothed in short, soft, rather dull hair, giving the appearance of having been clipped.

It is very different in appearance from the land spaniel of the cocker type, being in shape and size not greatly unlike the poodle, but differing much from this breed in texture of coat and in the perfectly smooth face. In disposition it is like both the poodle and the spaniels generally—kind, affectionate, playful, and bright, but showing a strong tendency to be a little aloof with strangers. They have also a strong trend toward obesity in age, when they become heavy, untidy, and decrepit.

CLUMBER, FIELD, AND COCKER SPANIELS

(For illustration, see page 227)

These rather closely related dogs may, like the setters, be considered each in relation to the others.

The clumber is the largest, weighing up to 65 pounds, though the average is probably about 50. He is perhaps best described as a very low, heavily built English setter, all white except for lemon or orange ears and eye-patches, with ticking of the same on forelegs and as little as possible elsewhere. He is a benign, affectionate creature and very sedate in manners.

As a gun-dog, he is used in England on woodcock, snipe, and other lowland birds, but he has never been much used or bred in this country. The soft, deep eye shows considerable haw in mature dogs. The coat should be almost perfectly straight, and the tail, belly, and legs, down to the hocks, should be full-feathered.

The cocker is the smallest of the three and is an active, playful, intelligent little dog, which takes on the spaniel dignity rather later in life than the clumber and the business-like field spaniel. He gets his name, "cocker," from the use to which he was bred in hunting woodcock. They are easily trained to fowling, being already predisposed in scenting out and flushing grouse-like birds (including the domestic hen). This tendency is taken advantage of and developed, to force grouse up into the trees, where they are easily shot. The cocker rushes his bird and then barks and keeps it busy and preoccupied. If the hunter himself flushed the game, it would go far and probably not again be seen.

The cocker should weigh from 18 to 24 pounds. In color he may be black, red, liver, or lemon, with or without white. These colors should be clear and pronounced, not pale or washed out, and if predominant over white should be virtually solid, the white being restricted to a mere dash on the chest. If white predominates, the color should be solid on ears and face, except for the fore-face and a blaze up the nose. In this case, color should be distributed about as in the English setter.

The ears, while long, silky, and set low, should not reach beyond the nose when drawn forward. The legs must be strong, straight, and of good bone and not too short, and the squarely built body hard and muscular. They are admirable house-dogs, but when kept as such should be rather sparingly fed and kept in good trim. A fat spaniel is not an attractive object.

The field spaniel is much larger and stronger than the cocker, but not so restless. He is, however, more active and lively than the clumber. While not so thoughtful-looking and sedate as the latter, he is highly intelligent, good-natured, and obedient. His body is long and low, but he carries his head with an air of courage and determination. His coat is straight and silky, and his color may be solid black, solid liver, liver and white, black and white, black and tan, orange, or orange and white. The black and the liver are the colors preferred. The proper weight is from 30 to 45 pounds.

NEWFOUNDLAND

(For illustration, see page 226)

Two dogs which rival the Eskimo in their ability to endure deep snow and extreme cold are the St. Bernard and the Newfoundland, both of which have become famous as savers of life. Both are well-known subjects of the poet and the painter, who delight to record their heroic deeds or their simple fidelity.

The Newfoundland has the further unique distinction among dogs of being figured on a postage stamp of his native land. He is a wonderful swimmer and is credited with saving many people from drowning.

It is a real pity that this noble, useful, and typically American dog should have lost popularity to such an extent that now he is almost

GREAT DANES

CHESAPEAKE RETRIEVER

CURLY-COATED RETRIEVER
IRISH WATER SPANIEL

never seen. Only two strains are preserved, so far as can be learned—one in England and one in New Jersey. Therefore it was a great pleasure as well as a great assistance in the making of the plate to meet face to face at the Westminster show of 1918 the straight descendant of the very dog whose photograph had been the artist's model.

The magnificent St. Bernard carries on better than any other breed the qualities that characterize the Newfoundland. For many years the breed, which had been perfected and stabilized in England, was used as a farmer's helper, having the intelligence needed for a herding dog and the weight and willingness to churn and do other real work.

His benignity and unquestioned gentleness made him a very desirable guard and companion for children, and his deep voice rather than his actual attack was usually a sufficient alarm against unwonted intrusions. Aside from these fine qualities, however, his mere beauty and staunch dependability should have been sufficient to preserve him from the fate that seems to be almost accomplished.

Weighing from 120 to 150 pounds and standing 25 to 27 inches at the shoulder, the deep-furred, massive-headed, and kind-eyed Newfoundland was one of the most impressive of dogs. He was strong, active, and leonine both in looks and in action, having a rolling, loosely knit gait. There were two recognized colors—all black (white toes and breast spot were not defects, however) and white, with large black patches over the ears and eyes and on the body, the latter being known as Landseer Newfoundlands, because a dog of this type is the subject of Sir Edwin Landseer's well-known painting, "A Distinguished Member of the Humane Society." The forehead was domed almost to the point of looking unnatural; the broad forehead, deep jaw, flews, and dewlaps betokened a kind and gentle nature.

SPITZ

(For illustration, see page 230)

The "wolf spitz" of the mid-Victorian fancier is now seldom seen in this country; yet he is a very interesting dog, having much to do in the gradual evolution of many types popular today. Almost unaltered except in size, we see him now as the popular toy Pomeranian (see page 251); his influence is easily seen in the saucy black schipperke (see page 258); there is little doubt that he has a share in the various shepherd dogs of central Europe, and one can see strong probability that this strain reappears in the fine dogs of the North, represented by the Samoyed and sled dogs of the Eastern and the Eskimos of the Western hemispheres, though it is not clear how it got there.

The true spitz is a dog weighing about 25 to 30 pounds, and the best dogs are white or cream-color, though fawn, brown, and even black dogs are found. The mixture of white in patches with any of these "self" colors is an unpardonable defect with the fancy. They are bright, fascinating, pretty dogs; but it must in candor be said they are very "choicy" in making friends and very ready to repel with sharp teeth any unwelcome advances by dogs or humans they don't know. They are apt to be a real responsibility to the owner on this account.

The Eskimo dog, Samoyed (page 234), spitz (page 230), and Chow-Chow (page 234), although differing in size and sometimes in color, probably had a common origin. Their dense coats show that they all properly belong in the North, and their straight, upright ears and general appearance betray their blood relationship to the wolf.

The spitz, usually solid white or solid black, has long been a favorite in Germany. Thirty or forty years ago it was popular in this country, but it is a dog of uncertain temper, and that may be one reason why it is no longer in favor, except in a reduced form as a toy dog.

ALASKAN ESKIMO DOGS

(For illustration, see page 230)

There is no set standard for Eskimo dogs, and nowadays one must go very far into the Arctic to find the packs pure and uncontaminated with the blood of the white man's dogs; for the best huskie is the strongest, most willing, and obedient dog, whatever his lineage, and these qualities have undoubtedly been increased through the introduction of such strains as the Newfoundland, Dane, shepherd dog, and others of less pure but equally civilized blood.

There are a good many names for the Eskimo dogs and a good many types, as their range covers a stretch of country some 4,000 miles long and 1,500 miles wide. It is therefore easily understandable that the dog of the Aleutians and Alaska should present quite a different appearance from that of Hudson Bay or Greenland.

The typical Alaskan "huskie" is generally black or dark, with white and buff markings, distributed as shown in the plate. The brown leader is the famous dog Napoleon, from Nome, who went as leader to France in 1915. The white-faced dogs are "huskies"; the "masked" dog in the middle is a "malamute," and the pale dogs are of the North Greenland type.

All Eskimos are strong, wolfy, self-reliant dogs, with straight, strong legs, solid body, and massive head; even of jaw, keen of eye and ear, and well equipped by nature for the semi-feral life they lead among their nomadic masters. They have the pricked ears, deep-furred neck, dense waterproof coat, well-furred feet, and gaily carried tail of all the Arctic and northern Asiatic dogs, and are represented by similar dogs across northern Lapland, Russia, and Siberia.

A good average weight for these dogs is about 70 pounds, though they often scale much more. They share with the Asiatic dogs the peculiar horizontal width of jaw so marked in the Chow. They are used by the Eskimos for

pulling sledges and for hunting musk-ox and Polar bear which are overtaken and held at bay until the hunters arrive.

NORTH GREENLAND ESKIMO DOG

(For illustration, see page 231)

Polaris was chosen as our model of this type because he has been considered the most perfect North Greenland Eskimo dog known. He shows the light color so prevalent among the dogs of the extreme north on both continents, and the marked depth and breadth of muzzle. This seems to be a characteristic of many Asiatic dogs, the Chow and Tibetan mastiff notably, and may point to an Asiatic connection with Greenland via the Polar ice or across Arctic America. There is a heavy, pale buff, deep-jawed dog found along the Arctic coast of America from the eastern to the western extent of land.

No white man living has had more experience with this breed than Admiral Robert E. Peary, who frankly admits that if it had not been for the sledge dogs he never would have discovered the North Pole. He is a firm believer in the pure-bred North Greenland Eskimo, which is practically a domesticated wolf, and most of the dogs which went to the Pole were of this type.

A puppy from these famous animals, secured by one of the coauthors of this article from Admiral Peary, was named "Polaris," and he developed into what Captain "Bob" Bartlett declared to be the finest living specimen of the breed.

Polaris weighed about 100 pounds, but looked much larger, owing to his wonderful coat, which at its best measured nine inches long on the shoulder. The hair of the tail was 12½ inches long. He took to the sledge and to the pack-saddle without any training whatever, and pulled a sledge three miles through deep snow the first time he was put in harness.

He was extremely gentle and affectionate with people and with a little Scotch terrier of ours, but a devil incarnate toward everything else that walked, flew, or swam. From grasshoppers and wild mice, through cats and pigs to sheep and cattle, there was nothing he could not or did not kill. Yet such was the magic of his smile, the twinkle of his eye, and the wheedling wave of his tail, that no one would believe anything against him unless he was caught in the act, which he usually wasn't.

He was finally presented to Dr. Wilfred Grenfell, and celebrated his arrival in Labrador by whipping every other dog in sight.

SAMOYED

(For illustration, see page 234)

Due largely to the efforts of Mr. and Mrs. E. Kilburn Scott, of Kent, England, the fine and picturesque Samoyed has become well established and pretty generally known both in England and America.

In appearance he is between a white spitz dog and a white Eskimo; in character he is one of the very nicest of dogs. He is of medium size, weighing about 40 pounds.

He has a little of the width of jaw that characterizes the Chow and other Asiatic types, and has the characteristic of all Arctic dogs of carrying his tail in a chrysanthemum-like pompom on his back. The fine dark eye, alertly pricked ear, and deep, soft, white coat make him everywhere a conspicuous favorite. The feet are well protected from the cold by thick fur between the toes, almost covering the black pads.

While the dogs bred in England and America are all of the pure white or pale creamy type, black, black and white, and brown and white dogs are found among the wandering Samoyed people of Siberia and the Arctic shores of Russia and Nova Zembla.

The Samoyed is a compact, staunch little sledge dog, used by the Samoyed, a seminomadic race living in northeastern Russia and Siberia. These people keep herds of reindeer, and some of the dogs are used in rounding up and driving these animals, much as collies are used in caring for sheep and cattle.

CHOW

(For illustration, see page 234)

Though there are two types of Chow in China, whence we got it, the smooth type has never been popular here nor in England, and may be ignored in this connection. The rough or common Chow is a most attractive and distinctive dog of medium size, always "whole" colored; red, black, brown, blue, or "smoke," cream or white. The red and "smoke" are the favorites among breeders and owners; the darker and purer the color the better.

Perhaps no dog has more individuality, nor knows his own mind better than the Chow. He is frisky, playful, intelligent, and willing to obey his master implicitly; the rest of earth's population has no interest for him whatever. Those the artist has known were entirely tolerant of his presence, and even his caresses, in their own home or when their master was with them elsewhere. Off the porch or on the street they will not so much as notice a stranger, except that it is impossible to put a hand on them or elicit a glimmer of recognition. Of all dogs they are the most consistently a "one-man" type.

The Chow has several real peculiarities, among which the most pronounced is the purplish black interior of the mouth, including the tongue. He is a very cobby dog, standing on four exceedingly straight legs. He is straighter in the stifle than any other dog. The muzzle should be short, the head square and massive, with a sort of scowl or frown that is helped by the widely set eyes.

The fur is very dense and deep, with a separate underfur like that of the Eskimo or other Arctic dogs, from which the Chow is supposedly derived. It also has the wide chops, small eye, and curly tail of his congeners.

NEWFOUNDLANDS

COCKER SPANIEL CLUMBER SPANIEL FIELD SPANIEL

The feet are small and catlike and the pointed ears are held upright. The neck all round has very deep fur, forming a sort of mane or ruff. All in all, he is about the most distinct type of dog to be seen. He has plenty of courage, though he is generally prudent and keeps out of trouble. With those he knows he is extremely patient, being in this respect a fine dog to be among children.

The Chow is a common dog in China, but in this country he is regarded as an aristocrat, which is not unreasonable considering his proud bearing and ancient lineage.

Whether black, red, yellow, blue, or white, he is a dog of striking appearance and reminds one of an animated Chinese carving.

ST. BERNARDS

(For illustration, see page 235)

The St. Bernard won both his name and his fame in the Swiss Alps, where for many years the monks of the Hospice St. Bernard have used dogs to assist them in saving the lives of travelers lost in the snow. One of these dogs, Barry, saved 40 people and was killed by the 41st, who mistook him for a wolf.

But the dogs used by the monks have changed greatly in appearance from time to time. Occasionally an avalanche will destroy a large number, and those remaining will be bred to Newfoundlands, Pyrenean sheep dogs, and others having similar characteristics.

Some of the dogs kept at the hospice now resemble powerful foxhounds and would never be admitted to an American bench show in competition with modern St. Bernards, either smooth or rough coated, such as are pictured on page 235.

The old-time working hospice dog had none of the grandeur of this more modern successor to his name, which has been compounded rather recently of several other dogs. Still he is about the most distinct of any of the large dogs, the Newfoundland being the only dog even remotely resembling him.

Like all very large heavy dogs, this breed is greatly given to weakness in the legs, cowhocks and weak hips being rather the rule than the exception. The "dewclaw," or extra hind toe, is also generally present (and was formerly considered desirable).

The perfect St. Bernard is a very large, very strong, straight-backed, strong-legged, and heavily organized dog, the colors, as shown, being those most eagerly sought. They may be either rough or smooth in coat. The best American dogs are those of Mr. Jacob Rupert, of Newark, N. J., and Miss C. B. Trask, of California. Indeed, it is doubtful if their dogs are to be surpassed anywhere.

The benign St. Bernard should show, in both types, broad, domed, massive head, loose skin, deep-set, rather mournful, eye, haw quite pronounced, and deep-folded flews and dewlap, though he should not be too "throaty." What is not mentioned in most brief accounts of this dog is the tremendously impressive voice in which he speaks. Probably no other dog has such a deep bass voice, nor such a volume of it. Yet it is as benign and kindly as his expression of countenance, and would tend rather to inspire hope and confidence than fear, even with the timid.

The deep personal affection with which St. Bernard owners invariably invest their companions is the best expression of the character of these great, dignified and rather somber dogs, which inspire no fear, even in little children, and which return the stranger's gaze with a look of calm, steady, and indulgent tolerance, and endure the advances of the unacquainted with a patience and dignity that speak worlds for their gracious and enduring disposition.

COLLIE

(For illustration, see page 238)

There is little resemblance between the working "collie" of the Scottish sheep-herder and the elaborately furred, slender faced, bench-dog now so popular. The broad-skulled, rather neglected looking "shepherd dog" of our boyhood, with his friendly, democratic manners (or lack of them) would get short shrift now at any show or gathering of the élite, while of all dogs his handsome, richly frilled descendant, with all the ear-marks of aristocracy, is the cause of more "Ohs" and "Ahs" than any other dog in the show.

Nevertheless, one might see an "ornery-looking," half-moulted type of the countryside handle a drove of 3,000 or more sheep in Saskatchewan in a manner to bring one up standing. And when, on returning at nightfall, he puts every ewe and lamb in one corral and every ram in another, without error or violence, one feels like asking him if he would shake hands with a mere spectator! It is doubtful if any borzoi-headed champion could do that with a lifetime of training.

Still, the collie is a most intelligent and handsome dog, and the present tendency is toward a greatly elongated and consequently narrowed head, forming almost a straight or even slightly deflected line from nose to occiput. The neck, throat, and chest bear a great frill of long hair, and the back of the thighs also is very deeply and richly furred. The hair of the body is long and straight, rather harsh, but with a deep and woolly undercoat. The feet, from hock and wrist down, should be smooth.

In color, the collie may be black and tan, "sable," or rich orange brown, with white frill, collar, and face "harlequin"; or white, with black spotting and freckling at random; "blue," or mouse color, and white, or even pure white everywhere. Some few kennels specialize in white collies and advertise extensively; they are very beautiful dogs, though probably requiring more care to keep presentable than the more "practical" colors, as our mothers would call them.

The collie should stand 20 to 24 inches and weigh from 40 to 60 pounds. He requires considerable exercise, and while growing up needs

watching to prevent his acquiring a taste for chickens and even lamb. Once this predilection gets established, it is hard if not impossible to eradicate.

In this country we know the collie chiefly as a beautiful, vivacious, and alert companion, but in the great sheep-raising districts of Scotland, northern England, and Wales, he is an absolutely indispensable assistant of the shepherd.

Not that the working collie looks very much like the long-muzzled, much-beruffled, and well-groomed specimens which grace the benches at our dog shows. He would never be allowed inside the ring at Madison Square Garden, and if he were he would stand about as much chance of taking a prize as a blue-ribbon winner would have of defeating him in one of the great annual sheep-dog trials of his native land. He lacks the superficial beauty necessary to win in the show-ring but he has the brains, the courage, and the stamina without which the sheep industry of Great Britain would quickly come to a standstill.

In the land of misty mountains one good dog can do the work of a dozen men, and there is no other animal which could possibly replace him.

Obeying the voice, or, better still, the whistle, of his master, a good working collie will "run out" to a distant pasture, round up his flock, separating them if necessary from other sheep, and bring them along at just the right speed; head off any which may try to take a wrong direction; go back and hurry those which lag behind; fight off strange dogs if necessary, and finally bring them into the fold without losing one.

Next morning he will take them away to the pasture and guard them all day, if asked to do so, or help his master to drive them to the market, along the quiet country lanes and the crowded city streets alike, preventing every attempt of his charges to wander or stampede.

The Shetland collie, a tiny sheep-herder weighing between six and ten pounds and imported from the Shetland Islands, is becoming known in the country as an attractive pet.

SMOOTH COLLIE

(For illustration, see page 238)

The smooth collie is to be judged by exactly the same standards in everything, except coat, as the rough, or common, collie.

The artist had never seen one and was somewhat desperate for a model, when to his surprise he found that the Belgian farmer who comes for the neighborhood garbage was accompanied by a fine specimen, brought with him in 1914 from home, whence he fled at the instance of the Hun!

It is somewhat of a surprise to see what a collie looks like in short hair, but it rather increases our regard for him than otherwise. For he is a fine, strong, "doggy" animal, and in this example, at least, the "refinement" which so often results in extremely nervous and high-strung dogs has not been sought.

The present fad for long, slender, roman-nosed and narrow-faced collies seems to introduce an entirely undesirable slenderness of temper as well, quite different from the genial, easy-going dependability of the "old-fashioned" collie, wide between the eyes and ears. It is a distinct loss to the breed.

ENGLISH SHEEP-DOG

(For illustration, see page 238)

Rapidly gaining in popularity, the curious woolly sheep-dog has become thoroughly established in the United States; he has long been used as a practical helper in the great sheep ranges of western Canada. He bears no resemblance whatever to the familiar collie type of sheep-dog, but looks rather like a great long-legged, round-headed, bounding terrier.

He has a formidable voice, very different indeed from the rather fox-like yap of the collie, and while he is some 24 to 27 inches at the shoulder and weighs 60 to 80 pounds one cannot quite get away from the impression that he is, in fact, a huge terrier of some kind. The effect is heightened greatly by the long woolly hair on his head and face, which virtually hides the clever eyes, and makes a study of his actual head-form very difficult. The hair on back and hips is very long; when combed out they look very curious indeed.

In color they are usually blue gray and white; any strong tendency toward brown is not good. The white usually occupies most of the head and fore-quarters.

He is a dog of very striking appearance—one might almost say of un-dog-like appearance. He is large, rather tall on the legs, tailless, and covered from head to foot with a long, loose hair, which tosses about freely when he runs or jumps, giving him the appearance of a huge animated floor-mop. But if you part the hair on his face you will find a pair of beautiful, intelligent, friendly eyes. He is active, good-natured, and makes a fine companion.

Dogs of this breed were not always bob-tailed; originally they were probably as well provided with tails as other dogs. Many of them were used for herding, and consequently exempt from taxation. It is said that the drovers amputated the tails of their working sheep-dogs to distinguish them from those which were not exempted.

It is believed by some authorities that this mutilation, continued through many generations, created in the breed a tendency to produce tailless and short-tailed offspring. Whatever the cause, it is certain that today many Old English sheep-dog puppies are born bob-tailed. When they are born with tails it is customary to dock them to within an inch or two of the root, and the operation is performed not more than four days after birth.

The docking accentuates the characteristic rounded quarters and increases the somewhat bearlike appearance of the animal.

SPITZ

ALASKAN ESKIMO DOGS

NORTH GREENLAND ESKIMO

GERMAN SHEPHERD, OR POLICE, DOG

(For illustration, see page 239)

On the continent of Europe there are many kinds of dogs used for guarding sheep, but those best known in this country are the German and Belgian sheep-dogs. They have come into unusual prominence within the last five years because of the notable part they have played with the Red Cross units and in other activities on the battlefields of France and Belgium.

This is one of the handsomest and most attractive of dogs, and approximates more closely than any other the really wolf type. Strong and clean of limb, bright of eye, and alert in every sense, gifted with a very high intelligence and a wonderful memory for what he has been taught, he is a most excellent and useful working dog.

The German shepherd dog should stand 22 to 26 inches at the shoulder and show in every line the qualities which he is supposed to possess: "intelligence, alertness, loyalty, gentleness, courage, obedience, willingness, and devotion." He is a graceful, powerful dog, with beautiful lines and curves denoting both strength and speed.

It is not necessary to mention the many uses he has been put to in the present war, as Red Cross, No Man's Land patrol, messenger, and ration-carrier. It is perhaps as well to say here that any such active, restless, vigorous, and intelligent animal as this becomes a grave responsibility to its owner and should be sedulously cared for and kept in control every minute.

They become very dangerous when neglected or turned adrift or thrown on their own resources by being lost, and once they form a habit of chicken or sheep killing they become inveterate and persistent in their maraudings and ordinarily must be shot.

One very beautiful dog of this kind was recently shot in the Catskills after repeated ravages which started a rumor of wolves in the region. This impression was very natural, and when the photographs sent to the Conservation Commission were identified as a dog the rustic sufferers were still only partly convinced. Dog it was, however, and apparently a very fine example of this new and interesting type.

While the standard allows great range of color, those most often seen in this country are of the so-called "wolf" colors—dark tipping of hair over a tawny or buff ground. The muzzle (unlike that of a wolf) is usually blackish.

Both the German and the Belgian dogs may be divided into three general types, namely, rough-haired, wire-haired, and smooth-haired. By their erect ears and general expression they betray their near relationship to the wolf.

Some of the varieties are becoming popular in this country as companions, and while they do not seem demonstratively affectionate they are staunch and loyal and conduct themselves with quiet dignity which is equaled by few other breeds.

THE BELGIAN SHEPHERD DOG

(For illustration, see page 239)

Many types of shepherd dogs have been developed in Europe, and doubtless a good many have just "growed," like Topsy. But it is not likely that the Belgian dog is of the latter class, for in common with several other Belgian varieties he has arrived at a very concise standard, and has proved in the present war one of the most dependable and valuable of dogs for the purposes of finding and bringing aid to the wounded in No Man's Land, as well as carrying messages where a man could not go and live.

He is a trifle smaller than the better known and more extensively advertised German shepherd, or "police," dog, and is usually solid black in color. He is also a bit stockier and less rangy in build and has a little more width of brow. While not so strong as his big, light-colored German congener, nor so formidable as an antagonist, he is equally intelligent and capable, equally keen of scent and sight, and probably less of a responsibility for his owner.

THE PYRENEAN SHEEP-DOG

(For illustration, see page 242)

One of the most beautiful dogs in the world is the Pyrenean sheep-dog, but, alas! the breed is almost extinct. Technically speaking, this animated snowdrift is not a sheep-dog at all, but closely related to the mastiffs. In form of body and texture of coat he greatly resembles the Tibet mastiff, though the latter is not so tall on the legs and is quite different in color, being velvety black, with rich tan markings.

Had the Pyrenean dog been a herder of sheep like the collie, no doubt his tribe would have been as numerous as ever; but the Spanish, and later the French, shepherds used him chiefly to guard their flocks against the ravages of the wolves and bears.

When wolves and bears became scarce in the Pyrenean Mountains, the need of this valiant defender grew less and the breed was neglected, until now but a few specimens remain.

The Pyrenean sheep-dog is one of the finest dogs that has been used in the manufacture of the present-day St. Bernard. It is quite possible that the old hospice-dog (which died out when roads and railways cut hither and thither through the Alps) was more of this type than is generally supposed.

The Pyrenean dog is one of the large dogs, but by no means so immense as the St. Bernard. A good male dog would probably weigh about 100 to 110 pounds, as against 250 pounds for the St. Bernard.

He is usually pure white or cream-colored and bears a coat much like that of a Newfoundland, only with more underfur and of a more woolly texture.

He has seldom been brought to this country or even to England. He is preëminently a guardian dog, used to insure safety to the flock from the attack of wolves, smaller and

nimbler dogs being used for the purpose of driving and herding.

The type is easier to conceive from the picture than by a written description. Like all dogs bred for utility, and not yet taken up by "the fancy," he is bound by no standard of perfection and is subject to considerable variation. The best dog is the one that does his work best, which is as it should be.

THE MASTIFF

(For illustration, see page 242)

If the Pyrenean dog is one of the most beautiful dogs in the world, surely the English mastiff is one of the most famous. It is regarded as probably the oldest of all British dogs, and, as we have seen, its ancestors were used by the Assyrians for hunting big game.

It is believed that this large, powerful dog was introduced into Britain in the sixth century B. C. by the adventurous Phœnician traders, and was used by the Britons in hunting and in warfare. The Romans found him well established when they invaded the island in 55 B. C., and thereafter mastiffs, because of their great size, strength, and courage, were used to fight in the Roman amphitheaters.

In more recent times the breed has become heavier and less active and has been used chiefly as a companion and a guardian of property.

Perhaps the most famous strain of mastiffs in England is at Lyme Hall, in Cheshire; it is said to have come down in unbroken descent from the fifteenth century. When I [Mr. Baynes] was a small child my father's place, "Harewood," was close to Lyme Park, and one of my earliest recollections is of going with my parents to an entertainment at Lyme Hall. Coming away we descended into a flagged court-yard, and I remember that we were at once surrounded by a number of huge, tawny dogs which I was told were the Lyme mastiffs.

Many stories are told of the services rendered by these splendid dogs to their masters, the Lees of Lyme. It is said that when Sir Peers Lee lay wounded on the battlefield of Agincourt, he was guarded by a mastiff which had followed him to the war and which lay beside him through the night. Sir Henry Lee, of the same family, was saved from death by one of the dogs, which pinned to the floor a valet who had come to his master's bedroom to murder him.

The perfect mastiff may be either fawn with a dark face, ears and muzzle, or brindle. He stands about 28 inches, and should weigh about 170 pounds. There should be no dewclaw, and the small, dark eye should show no haw. Strong, straight and heavy, both of body and limb, with a deep chest and massive square head, the perfect mastiff is an exceedingly splendid-looking animal.

He is now bred mostly as a companion, and never sees service in his old romantic calling. He is probably part ancestor of the great Dane, whose principal other component is greyhound. One of the noblest of dogs, it is to be regretted that his unwieldiness and expensive keep have rendered him rather unpopular, so that now he is indeed rarely seen.

Points to avoid are a light, narrow, or undershot head, cow-hocks, sagging back and rolling gait, weak legs and bent pasterns, curly tail and pale face.

BULLDOG

(For illustration, see page 246)

The English bulldog for hundreds of years and in almost every land has typified unflinching courage and unshakable determination. As the lion has been used to represent the majesty of Great Britain, so the bulldog has been used to represent her persistence—her ability to "hang on" until she has accomplished whatever she has undertaken.

As his name implies, the bulldog got his name from the fact that he was used in the old-time "sport" of bull-baiting, which was popular among certain classes in England for at least 700 years, until it was made illegal in 1835. Even after that, occasional matches were continued illegally until 1853, and the actual rings for bull-baiting still remain in several places in England.

The "sport" was usually held at some "garden" maintained for this and similar purposes, or sometimes in a public market-place. Here a bull with a rope about his horns was tethered to a ring bolted to a rock or to a stake driven into the ground. The rope being about 15 feet long, the bull had considerable room in which to move without being able to endanger the lives of the onlookers.

The object of the dog was to seize the bull's nose in his teeth, pin it to the ground and not leave it. He was bred with an undershot jaw and a retreating nose, that he might hang on to the bull and breathe easily at the same time.

The bull, of course, did his best to toss the dog with his horns, and often succeeded. Pepys, who witnessed a bull-baiting in Southwark in 1666, naïvely describes it as "a very rude and nasty pleasure."

The dogs were also used to bait full-grown bears and for dog-fighting. For such work they had to be not only strong, but very active They were real and splendid dogs in spite of the barbarous uses they were put to.

The bulldog of today is a grotesque deformity — short-legged, short-winded, short-lived, and barely able to reproduce its kind. It is chiefly useful for infusing courageous blood into other breeds, for adding variety to a dog show, and as an example (to be avoided) of what can be done by senseless breeding to spoil a perfectly good dog.

But they haven't quite spoiled him, for he still retains his old-time dauntless courage, and he has a homely smile that would melt the hearts of even the few unfortunates who boast that they hate dogs.

And here is an appropriate place to register a friendly protest against the arbitrary fixing of points for which dog owners must breed in order to win at the dog shows, without suffi-

SIBÉRIAN REINDEER DOG or SAMOYED

CHOW-CHOW or CHOW

SMOOTH ST. BERNARD ROUGH ST. BERNARD

cient reference to the requirements of the dog as a working ally of man.

No one feels more deeply the debt of gratitude which we owe to the many intelligent and unselfish breeders who, often at great sacrifice of time and money, have given us our long list of useful and beautiful dogs. But there is tendency in the very proper enthusiasm over dog shows and show dogs to forget that the primary object of breeding most dogs is to produce animals which are useful in different fields of activity, and not to conform to a particular standard unless that standard is the one most likely to develop dogs fitted in mind and body for the work required of them.

With the idea of making as ugly and surly looking a beast as possible, the present standard for the bulldog demands a type that is all but unfitted for existence, so great are the deformities exacted of this unfortunate dog. Undershot so that he can scarcely eat his food; teeth that should normally meet never being able to do so; the nose so jammed in that breathing through it becomes almost or quite impossible; the shoulders so muscled and legs so out-bowed as to make locomotion difficult, he is indeed a tribute to the art of man in its most perverted manifestation.

The large, square, heavy head has the face deeply wrinkled, the lower jaw three sizes too long for its mate, the nose thumbed back into the face, the eyes very wide-set and low on the face and the ear wrinkled back to form a "rose." A straight-edge laid along the top of the head should touch forehead, eyebrow, nose and *lower* jaw; the neck is thick and short, the shoulders very wide and low, the back curving up to the hips, which are a little higher than the shoulders. Hind legs strong, arched, with the stifle and toes turned out a little and the hock correspondingly turned in. Brindle is the favorite color, but white, black and white, fawn, red, brown, and even solid black are met with. A good bulldog should weigh from 30 to 40 pounds.

He is a good-natured, gentle creature, in spite of his forbidding appearance, and makes a safe and dependable family dog. When once aroused to anger, however, his tenacity and courage are proverbial, and he justifies every claim that could be made for him, being totally without fear, under whatever odds he may be placed, and apparently insensible to pain, staying at his battle to the very death.

There has been developed in England a so-called "miniature" bulldog with a maximum weight of 22 pounds. A perfect specimen has been described as the larger variety seen through the wrong end of a telescope. As the weight would indicate, he is not a toy, and is highly regarded as a companion by those who require a staunch little dog not quite as active and excitable as most terriers are.

THE FRENCH BULLDOG

(For illustration, see page 243)

The French bulldog, we are told, was originally a Spanish bulldog, a much larger animal, formerly used in Spain for baiting bulls. But dogs of the original type found their way to France, where they were eventually reduced in size and "beautified," until today a normal specimen of this breed is not unlike a miniature bulldog, except that his teeth do not show when his mouth is closed, and that he has well-rounded "bat" ears, which form perhaps his most noticeable characteristic.

This bat-eared, flat-faced little gnome among dogs has a wide and enthusiastic following. The reason for this is doubtless that he is such a nice little dog in spite of all man can do to make him unfit for life, by condensing the nasal region and developing an oversize jaw. The bulldog tendencies are exaggerated. The head is similar, but the face is flatter and more vertical in profile, with the jaw somewhat less turned up. They are perky, inquisitive little things, but much given to asthma and the sniffles, which is not their fault but ours. The proper color is dark brindle, though light brindle is not frowned upon. More than a trace of white on toes and chest is discountenanced. The tail, carried low, should be either screwed or straight.

In form he is all bulldog, the only radical differences being the flat face and the large upstanding ears, graphically called "bat-ears" by the fancy. These are important, and should be wide at the base, tapering up to a rounded point, carried high but not too close together, and with the orifice directed forward. The light weight should weigh under 22 pounds, the heavy weights from 22 to 28 pounds.

Next to toy dogs, the French bulldog and the "miniature" bulldog (see preceding sketch) are among those best suited to city life. Neither of them requires a great deal of exercise, and with intelligent, thoughtful owners may be kept successfully, even in a flat. But life in a flat, even for dogs of this kind, is a hard one unless they are the care of some conscientious person who will give them daily exercise.

THE TERRIERS

(For illustrations, see pages 243, 246, 247, 250, 251, 254, and 262)

The terriers, as their name suggests, go to the earth (*la terre*) for their prey—dogs primarily intended to unearth foxes, badgers, rabbits, rats, and other comparatively small animals which seek refuge in burrows in the ground.

"Ay, see the hounds with frantic zeal
The roots and earth uptear;
But the earth is strong and the roots are long,
They cannot enter there.
Outspeaks the Squire, 'Give room, I pray,
And hie the terriers in;
The warriors of the fight are they,
And every fight they win.'"

Though dogs of this general character have been used perhaps for a thousand years, little attention was given to classification until comparatively recent times. For example, the

modern fox terrier is a very definite breed, but in the middle of last century almost any dog of terrier size and build, with the strength and courage to go into a burrow and pull out or "bolt" a fox, was a fox terrier. Many other dogs were as loosely defined.

Most of the terrier breeds we see today have been developed within a hundred years, and a good many of them within fifty. And this is not surprising when we consider that the first dog show under modern conditions was held in England only sixty years ago, that the first trial of dogs in the field was held six years later, and that in spite of the fact that dog shows at once became popular, it was not until fourteen years after the first show that there was any organization having authority to regulate such exhibitions.

With two or three notable exceptions, terriers are rather small dogs, and generally speaking are bright, active, vivacious little rascals, full of fun and mischief and with courage out of all proportion to their size.

Almost all of them make good companions and are ready to "do their bit" when rats and other vermin begin to make themselves obnoxious.

They are sometimes divided into three groups, as follows: (1) Smooth-coated:—black-and-tan or Manchester terrier, bull terrier, Boston terrier, smooth fox terrier, Dobermann Pinscher; (2) broken-haired:—wire-haired fox terrier, Airedale, Bedlington, Irish, Welsh, Scottish, West Highland white; (3) long-haired:—Skye and Yorkshire. There are others, but these are the ones most commonly seen in this country.

The white English terrier, one of the older breeds, has seldom been seen in America and seems to have almost died out even in England. No doubt it played its part in helping to establish some of the more modern varieties.

The bull terrier, formerly known as bull and terrier, is probably one of these, the cross with the bulldog giving the size, strength, and courage necessary to make the great fighting dog developed by the English gamesters in the early half of last century.

The old wire-haired black-and-tan terrier also probably contributed to the making of this dog, which as a canine fighting machine has never been equaled. Literally, he would sooner fight than eat, and no matter how brutal and degrading dog-fighting may be, we cannot but admire in a dog, as we do in a man, those qualities which enable him to bear without whimpering the severest punishment and physical pain, sometimes for hours, and finally die in the pit rather than save himself by showing "the yellow streak."

Fortunately the "sport" has long been prohibited by law, and practically died out in England fifty years ago. Though illegal in this country, it still flourishes among certain classes and in certain sections, and pit-bull terriers have been exhibited at a big bench show in Ohio within a very few years.

Most of these dogs were brindle and white in various proportions and had much shorter faces than the now thoroughly respectable and gentlemanly white bull terrier so well known to us all and so skillfully depicted in Richard Harding Davis' "The Bar Sinister"—one of the best dog stories ever written.

The bull terrier is a very strong, active, tenacious dog, and some supporters even claim great intelligence for him.

The accepted type is pure white with a black nose. He is a very symmetrical dog, splendidly muscled, with very straight legs and sturdy sloping shoulders, rather short, compact body, and a long, even muzzle, with heavy jaw muscles. He is built to fight other dogs, and nothing has been sacrificed, as with the bulldog, that will help him in the combat. They fight without a sound, whatever their punishment.

The small, oblique, triangular eye, coupled with the pink showing through the fine hair of face and muzzle, give even the best bull terrier a somewhat piggy look. But aside from this he is a handsome, active, and sturdy dog, free from nonsense, and with a good dependable disposition, although his capable shoulder seems to carry an invisible but easily dislodged chip on it. Other dogs, whatever their size, have no terrors for him.

MANCHESTER, OR BLACK AND TAN TERRIER

(For illustration, see page 243)

This active, speedy little dog has had much influence in the formation of many of the present-day breeds.

A generation ago the "rat terrier," as he was commonly and very appropriately called, was a well-known and popular dog, though now he is rarely seen. He is a product of the mining region of Manchester, England, and was quite a prominent figure in the holiday sports of that district.

His "long, flat, narrow, level, and wedge-shaped" head had little room left in it for good nature, after the native keenness and self-interest had been accommodated, and this breed has never been as popular with the outside world as with its owners on this account. Although they are very spirited and courageous, they are apt to be very short-tempered and snappy.

He is a beautifully set up little dog, clean of line as a greyhound, and only a degree or two less slender. He is entirely black, except for the deep mahogany tan that covers the chops and throat, chest, inner sides of legs, feet (except black toe-tops), ear linings, spots on eyebrows and the papilla on the cheek, and the under side of the tail at the root. His coat is close, hard, and very glossy, revealing his beautifully muscled, yet delicate frame. About 18 inches high, he should weigh 16 to 20 pounds, though a diminutive toy type exists, which is the tiniest of all dogs.

COLLIE OLD ENGLISH SHEEP-DOG SMOOTH COLLIE

POLICE DOG BELGIAN SHEPHERD

DOBERMANN PINSCHER

(For illustration, see page 243)

Perhaps the finest terrier with black-and-tan coloring is the Dobermann Pinscher, a sort of glorified Manchester terrier, which has been developed in Germany within the last 60 years.

He is about the height and weight of an Airedale, but perhaps by reason of his smooth coat and the fact that his tail is docked very short, he appears taller and slimmer than the British dog. He has a splendid carriage and an air of dignity and distinction. He is unusually intelligent, and to this fact may be attributed his phenomenal success as a police dog. His delightful personality is rapidly bringing him into favor with Americans looking for a dog of good size that doesn't get in one's way.

This big German derivative of the black-and-tan, or Manchester terrier, might best be described as a large, strong bull terrier, with the strict black-and-tan coat, although one sometimes sees him in solid black, brown, or mole-color "blue." White should never be present in a good Dobermann, nor other parti-color than black or tan.

Like most of the dogs popular with the Germans, this is best handled with a firm and uncompromising domination. He is a willing and effective fighter, and, true to his terrier blood, is a relentless enemy to all ground vermin, such as marmots, hares, and badgers.

Decidedly a "one-man" dog, he does not readily make friends nor welcome advances of a friendly nature. He is faithful and loyal to "the hand that feeds him," however, and is justly popular with those who own him. He is certainly one of the handsomest of the smooth dogs, being glossy of coat, trim, and straight, and strong of leg and body, and bright and keen of eye, lacking entirely the rather piggy look of the bull terrier with which he has been compared. He is rather larger than the bull terrier, however. He has never been extensively bred in this country.

BOSTON TERRIER

(For illustration, see page 243)

The Boston terrier is an American-made animal, whose bull and terrier ancestors came from England between 40 and 50 years ago. Many of them settled in Boston, where they became so refined that in a few generations much of the bulldog was bred out of them.

When, about 1891, their owners formed the American Bull Terrier Club of Boston and applied to the American Kennel Club for the registration of the breed, the application was refused on the ground that the dogs were no longer "bull" terriers.

It was suggested that the breed be named simply "Boston terrier." This suggestion was accepted, the club changed its name to the Boston Terrier Club, and the breed received full recognition in 1893. It is said to be the most scrupulously courteous dog having any bulldog blood in his veins, and is generally recognized as the most conservative terrier in the world.

The Boston terrier is not as large as the bull terrier, weighing from 15 to 27 pounds, and being judged in three classes, according to weight. The most popular "middleweight" class is from 17 to 22 pounds. The ideal markings are brindle (dark preferred, some are almost black), with white muzzle, blaze, neck all round, chest and all or part of fore legs and hind legs below hocks. The coat is short, smooth, and bright. The ears are commonly trimmed.

The deformities of the bulldog are here happily lacking, and we have a bright, playful, courageous little dog that stands well over (not hangs between) his legs, which, while well apart, are not bowed nor bandied, but strong, fairly heavy in bone, and straight. The stifle, however, is well bent. He is all in all a very compact little dog. The tail, "screw" or straight, must be carried low.

The face is intelligent, rather square, the nose, while short, is not pushed in, and the jaws are even, broad, and fairly deep. He is in every sense a good practical dog.

FOX TERRIER

(For illustration, see page 247)

Among the best known of all dogs is that buoyant, irrepressible, and violently affectionate creature known as a fox terrier. Somehow he is always associated in many minds with sunshine and dancing, and when properly cared for and kindly treated he is a joyous thing.

Like other dogs, when ill treated or badly cared for, he can degenerate into anything. Often, from overfeeding and insufficient exercise, he becomes fat, and a fat, wheezy dog, except an aged and decrepit one, is a disgusting object to any real dog lover.

There are two varieties of fox terrier—smooth-coated and wire-haired—and which is the better is a matter of taste. It is true the smooth-coated dog has always been the more popular, but apparently for the sole reason that his coat is smooth; in other respects the dogs are almost identical.

When properly reared and trained they are as courageous as they are cheerful, which leaves little to be said for their courage.

The smooth fox terrier is a sprightly, clean-cut little dog of from 12 to 20 pounds weight, with a short compact body and straight, strong legs that never tire or even show signs of fatigue. His keen, rather pointed nose should taper smoothly to the head, with just a little "stop," and a slight break in the line of the nose and forehead. The alert expression is due partly to the bright, rather deep-set eyes and partly to the pointed, semi-erect ears, which turn inquisitively forward. The jaws, while fine and fox-like, are deep enough to be of good service, and as a vermin dog the fox terrier has no superiors in courage and willingness to face the music.

In color he should be chiefly white, with black markings on head and body. These are to be left largely to the taste of the judge; a little tan is usually seen if the head is largely marked, occurring on the chops and in a small spot over the eye and where the "bristle" grows on the cheek; brown, red, or brindle body markings are decidedly objectionable.

The wire-haired fox terrier should conform to the standard for the smooth dog in every respect except in coat. In place of the close, smooth, hard coat, he should have a hard, wiry, harsh coat of broken surface. Silky or woolly hair is very faulty.

THE IRISH TERRIER

(For illustration, see page 247)

The Irish terrier has well earned his nickname "dare-devil," for he has few if any equals for sheer reckless courage. He is an interesting, loyal pal, and until he "hears the call of duty," he has a quiet, unobtrusive manner, which is very deceptive; but he will stand for no nonsense, and once trouble has been started, he'll stay till it's over.

While on a hunting expedition in Africa a few years ago, some hunters were trying by means of a pack of dogs to dislodge a lion which had been brought to bay in a dense tangle of bushes. For a long time they had been unsuccessful, when, without any apparent reason, the lion bolted from the cover. A moment later the reason became apparent. As he dashed into the open his tail stood straight out behind, and on the end of it was a little Irish terrier with his teeth locked.

The Irish terrier is intermediate in size between the Airedale and the Welsh, and is a "self-colored" dog, either wheaten or red. The latter is more desirable. In weight 24 pounds is perfection, and in general contour he should be the counterpart of the Airedale, differing only in size and in color. In disposition he is a true terrier; staunch and courageous, and as he attains years he takes on a dignity and self-reliance rather unusual in a dog of his size. He is essentially a rough or wire-haired dog, and silky or woolly hair is a distinct fault.

THE WELSH TERRIER

(For illustration, see page 247)

The Welsh terrier may best and most briefly be described as a wire-haired fox terrier colored in general like an Airedale. This does not of course cover the finer points, but gives a general impression of his looks.

He is in every respect a true terrier, and closely resembles a diminutive Airedale. His color is very strictly dictated by the standard; he must have tan legs, belly, and head, with a *black* saddle, and black on the forehead and all around the neck. This is sometimes replaced by grizzled gray, but it is less typical and not as popular as the pure black and tan. Black on legs or feet is very bad.

Being a fine, sturdy, active and friendly little dog, the Welsh terrier is rapidly gaining popularity in this country, and the breed was represented in the 1918 Westminster show by a large entry.

AIREDALE TERRIER

(For illustration, see page 250)

By far the most popular big terrier, in this country at least, is the Airedale, and for an all-around dog he would be very hard to beat. He is afraid of nothing that walks or crawls on land, and his great fondness for the water betrays the otterhound blood which is in him.

While not necessarily quarrelsome, this dog knows his strength, and as a rule will not walk far out of his way to avoid a scrap. Airedales are usually intelligent, and hundreds of them have been used for Red Cross work on the battlefields of Europe.

So well established and in such favor is this breed today, it is hard to believe that sixty years ago it was practically unknown outside of Yorkshire, England, where it existed as an unkempt, shaggy-coated, long-eared mongrel, in which the blood of the otterhound and the old black-and-tan wire-haired terrier were easiest to recognize. But after about thirty years of careful breeding most of the hound blood was bred out of him, and there was left something very much like the stylish, well-built, well-marked Airedale, now to be seen everywhere.

To be a "good" one, he should weigh from 35 to 45 pounds, and be about 22 inches high, and of the color and type shown in the plate. The distribution of the tan or sandy color is rigorously dictated by standard; the saddle and neck may be either black, which is preferable, or grizzled gray. The head, set at an exact right-angle to the straight, strong neck, should be long, and a straight line from occiput to nose, or very slightly "roman." This effect is frequently heightened by the hair on the face between the eyes, being a little longer than that on the nose and crown. There is quite a marked tendency for the hair on the lips and chin to be long, forming a sort of beard.

The back must be straight and strong, the legs also must be very straight and well boned and muscled, the feet short and round.

This is one of the best of terriers, and of his thousands of owners hardly one could be found to say an unfavorable word for him. Being a terrier, he is playful and rather destructive in his youth, but in a season he grows up, and becomes a remarkably thoughtful, companionable, and dependable dog. He can be trained to hunt, but is rather impetuous for this work.

The hair should be fairly long, hard, and nearly straight. It would be hard to win a ribbon with a curly Airedale, however good otherwise. Cow-hocks, a marked stop, sprung pasterns, and white markings are all defects.

PYRENEAN SHEEP-DOG

MASTIFF

MANCHESTER TERRIER DOBERMANN PINSCHER

BOSTON TERRIER FRENCH BULLDOG

BEDLINGTON TERRIER

(For illustration, see page 250)

The Bedlington terrier is a dog of very deceptive appearance, and this may account in some degree for the fact that he has never been very popular.

Clad in a woolly coat and a smile that would have graced Mary's little lamb, one who did not know him would hardly suspect the stout heart which beats beneath the wool—the steel-trap jaws behind that cherubic smile. He's as game as the gamest, and if you had a Bedlington terrier between you and a wild cat—well, you should feel sorry for the wild cat.

There has never been a pronounced fancy for the Bedlington in this country, though he is a very distinctive dog, resembling no other type. Not quite as large as the Airedale of today, he is characterized by his harsh, rough coat and his curiously lamblike head, occasioned by the silky pale top-knot and brow.

The only one the artist ever knew was an inveterate ratter, and if the breed is as good on all vermin as this one was on his favorite quarry, it should be popular as a pest-ridder!

In conformation they are true terriers—straight of back and leg and active to a degree. Their color may be blue, blue and tan, liver, liver and tan, sandy, or sandy and tan. In all colors the head should be decidedly paler than the rest of the dog.

The Dandie (or Dandy) Dinmont, a Scottish terrier rather popular in this country, resembles the Bedlington somewhat, but is extremely short in the legs and big in the head. He is a quaint, affectionate little fellow, whose woolly crown gives an odd expression of sadness to the half-hidden eyes.

SCOTTISH TERRIER

(For illustration, see page 262)

Of very different appearance, but with the same stout heart, is the Scottish terrier, or "Scottie," as he is familiarly called—a short-legged, stocky-bodied, wire-coated "tyke," who looks like nothing else in the world.

Of course, he hails from the Highlands of Scotland, where he is used to unearth foxes and other "varmints." His pluck has earned for him the soubriquet "die-hard," and usually he "lives" right up to it.

The "Scotty" is a "one-man dog." There is probably no dog more indifferent to the advances of any one but his own master or mistress. Mrs. Baynes has a Scottish terrier named Heatherbloom. The little tyke cares nothing for the other side of the Baynes household, and only in the absence of her mistress will she condescend to follow him. For her, other people do not exist, except as things to bark at sometimes. But to the one and only mistress she is loyalty itself.

If separated for five minutes, the little terrier greets her as if she had not seen her for months. And if Mrs. Baynes is ill, Heatherbloom will lie on the bed hour after hour, her head between her paws, and her bright eyes, half screened by her long lashes, steadily shining on the face she loves.

His trustful eye, homely comeliness, and whimsical playfulness combine to endear the Scottish terrier strongly, and no dog is more companionable or unobtrusively affectionate. In these traits he is much like his rough little cousin, the West Highland white, from which, in fact, he differs in nothing so much as in the color of his coat.

The Scotty is usually black or very dark grizzled with yellowish tips, although steel or iron gray, brindle, sandy and wheaten specimens are occasionally seen. The dark dogs are much more popular here, however. A good dog should stand 10 to 12 inches and weigh 16 to 20 pounds.

The long-whiskered face; low, strong body; short, heavy legs, and rather heavy though gaily carried tail are all "earmarks" of the well-bred Scotty. He is all terrier, and with all his busy, active ways he combines a dignity and solemnity of manner that is very amusing.

THE WEST HIGHLAND WHITE TERRIER

(For illustration, see page 262)

The West Highland white is almost the counterpart of the Scottish terrier except in color, which must be pure white, with black nose. The forehead is higher, and a distinct stop is evident in the profile. The coat is double, the long outer hair being very harsh and wiry, the under coat much shorter and softer.

The Cairn and Sealyham terriers are rapidly coming into popularity, and belong in this group. The Cairn terrier has less pronounced whiskers than the Scotty, and his coat is somewhat shorter and reveals his form rather more, while the Sealyham is quite different in that the ears, instead of being short and pointed, are quite long and lop forward like an Airedale's. In color they are like the wire-haired fox terrier—white, with or without patches of black (or sandy red) on the face.

The Sealyham is supposed to have Dandie Dinmont in his make-up, which gives him substance and rather a more bandy-legged appearance than Scotty or his white cousin should have. The head, with its lopping ears and more pronounced stop, has a less piquant expression. The tail is docked and carried high.

THE SKYE TERRIER

(For illustration, see page 262)

No doubt in his earlier days the Skye terrier was a good sport, but of late years he has given so much consideration to "dress" that he has degenerated into a lap-dog. His coat, which is his chief title to distinction, is so

long that it is not easy to see whether he is going or coming. And he can't tell you, for there is so much hair over his eyes that he can't see for himself.

The long hair covers this dog so completely as totally to conceal the physical characteristics it is supposed to possess. There are two types: those with pendent ears and those with upright "pricked" ears.

The dog himself is long and low, like the other Scotch terriers, and the hair, which parts from his nose to his tail, comes nearly or quite to the ground. This outer coat is quite hard and nearly straight, curls being a grave fault, though a moderate wave is generally present; it should be at least 5½ inches long on the body, though shorter on the head. It falls forward and nearly conceals the eyes. The only visible feature of a good Skye is his black button of a nose. The undercoat is much softer and more sympathetic to the touch.

In color the Skye may be dark or light "blue" or gray, or fawn with black points. The height is about 9 inches and the weight 16 to 20 pounds.

THE YORKSHIRE TERRIER

(For illustration, see page 254)

The Yorkshire terrier (page 254), as a rule, is frankly exhibited as a toy. This breed, too, claims to have had sporting instincts, but today he is an artificial creature, and, so far from being useful, practically requires a valet to keep his beautiful long, silken coat in order.

Special brushes are made for his benefit, special cosmetics are recommended for his hair, and very often he takes his meals with a mask on to keep his long whiskers out of his plate. Many owners go a step farther and put cotton or linen stockings on his hind feet to protect his precious coat when he scratches himself.

This little dog is virtually concealed by his long silky coat, which reaches to the ground. It is parted on his nose; the part extends uninterrupted to the root of the tail, which is of medium length, carried straight out.

He is in general a delicate refinement of the Skye, which he resembles strongly in conformation. His back must be level and straight and he must carry his head well up.

The standard dictates a very strict color scheme: the body from just back of the ears is all steel blue; the head and feet are all golden tan, the shorter hair of nose, ears, and feet being darker and richer, the long, flowing hair of crown, cheeks, and chest being dark at base, but growing steadily paler toward the extremities.

There are three classes, according to weight; 5 pounds and under, 7 pounds and under, but over 5, and over 7 pounds.

THE MALTESE TERRIER

(For illustration, see page 251)

The Maltese terrier, which should be pure white, is said to be of very ancient lineage and to have been a favorite of the ladies of olden Rome. He is covered with long, straight, silky hair from head to toes, and he has dark, snappy eyes, which in some individuals give an appearance of great alertness and intelligence.

Some dogs of this breed are very bright, active, and interesting. Others are so delicate that they are kept in glass cases for fear of draughts—little more than slightly animated pen-wipers.

The head is like that of a droop-eared Skye, being, however, rather shorter and deeper in muzzle. Like the Skye and Yorkshire, this breed is completely lost in his coat and has to be felt of to be judged. He must not exceed 10 pounds in weight.

THE POMERANIAN

(For illustration, see page 251)

Toy dogs have been developed from larger breeds by selective breeding. They all serve one main purpose, and it is a good one—they bring joy and companionship to the thousands of people who own them. And they do harm to none, unless it be to those very few foolish people who lose all sense of values and make themselves the slaves of their canine pets.

As companions, even little dogs are far preferable to cats. They love with an unselfish love, which cats do not, and they are guiltless of the slaughter of the millions of useful birds which are destroyed by cats in the United States alone every year. If we keep pets, it is our duty to keep those which are not perennially destructive to useful things.

One of the most popular toy dogs in this country and in England is the Pomeranian, which from his general appearance, including the bushy tail curled over the hind quarters, would appear to be descended, long ago, no doubt, from the Samoyed dog of the north (see page 225). Their more recent forefather is the spitz (see page 224), and today the chief difference between a spitz and a Pomeranian is in size.

As a result of careful breeding, many "Poms" are less than five pounds in weight, and in addition to black and white we now see several beautiful colors, including blue, brown, sable, red, orange, and fawn.

The best, or at least most desired, class scale under eight pounds. They are deep-furred, kitten-footed, round-headed, pointed-nosed, prick-eared, mincing little toy dogs, and they come in all colors, but the parti-colored ones are not so desirable and are seldom seen.

The coat consists of a deep, soft, fluffy underfur, through which protrudes a plentiful overfur of long, straight, glossy hair covering the whole body, being especially full and abundant on the throat, chest, neck, rump, and hindquarters. The tail is a pompon flowing over the back. The legs are straight and delicate, and the dog in action is exceedingly light and "steppy."

BULL TERRIER ENGLISH BULLDOG

SMOOTH-COATED FOX TERRIER

WIRE-HAIRED FOX TERRIER

IRISH TERRIER

WELSH TERRIER

THE PEKINGESE

(For illustration, see page 254)

This Oriental toy is of great antiquity, as is proved in the art and sculpture of ancient dynasties in China. He is a tiny, soft, cuddly, little creature, rather less exclusive in his friendships than the English toys, easily distinguished from them and from the toy spaniels by his long, low body and short legs, as well as by his deep, soft, straight, and woolly rather than silky coat.

The fancy desires a type whose expression implies "courage, boldness, self-esteem, and combativeness, rather than prettiness, daintiness, and delicacy." As a rule, they have plenty of self-esteem; most of them are fully aware of their immunity from deserved punishment, due to their tiny size and general defenselessness, and take full advantage of it.

They are of any color, to meet the whimsical tastes of the wealthy; it would be foolish to lose a sale, at prevalent Pekingese prices, because a purchaser liked a "wrong" color, and the fancy is accordingly lenient.

He has the short muzzle, full (not to say poppy) eyes, prominent "dome," and pompon tail of all toy spaniels, but he excels all in the elaborate ruff on the chest, and long, rich feather from thighs, sides, and fore legs. He must be under 18 pounds, and the smaller he is the better.

The Pekingese are the sacred temple dogs of Peking, and were once so carefully guarded that their theft was punishable by death. The first specimens to reach England were brought over in 1860 by Admiral Lord John Hay, who found them in the garden of the Summer Palace, where they had doubtless been left when the court fled to the interior on the approach of the Allied forces. These, with a few other specimens smuggled out of China, often with great difficulty, were the ancestors of many of the "Pekes" we see today.

With his comparatively large head, crush nose, and wide-apart eyes, the Pekingese looks as quaint as a bit of ancient Chinese pottery.

JAPANESE SPANIEL

(For illustration, see page 254)

There are many kinds of toy spaniels, and in imperfect specimens it is sometimes difficult to know just where to place them. To add to the ease of confusion, fashion or caprice sometimes dictates new names for old friends, and the maze of synonyms is hard for the uninitiated to follow.

The Japanese is largely white, with either black or red, brown, fawn, or orange patches, clearly and as near as possible symmetrically distributed. It is virtually essential that the head should be marked about as shown, with the eyes, cheeks, ears, and sides of neck dark, leaving the muzzle, stop, forehead, and crown white.

This is a cobby little dog, standing well up on its legs (thus differing from the Peke). The ears are moderate—in fact, small—for a spaniel. The nose is very short and the forehead very high and round. It would be badly apple-headed in other breeds than toy spaniels, where it is a much-cherished "dome." The tail is carried on the back or twisted high to one side. In shows they are classed as above or below seven pounds. Like all these toy terriers, they are snobbish to a degree and view all strangers from a disdainful angle, and are ready with a repellent snarl or snap to meet any advance.

The Japanese spaniel is also of ancient Eastern origin and may have descended from the Tibet spaniel, which is supposed to be the ancestor of the Pekingese. But he is a much smaller dog, weighing from four to nine pounds or thereabouts. Like other Oriental lap-dogs, he was bred small that he might easily be carried in the sleeve.

THE KING CHARLES SPANIEL

(For illustration, see page 255)

This is one of the English toys, which name in this country includes the King Charles (named after Charles II, with whom they were favorites), Prince Charles, or tricolor; Ruby, and Blenheim spaniels. They differ from one another only in distribution of color, being identical in conformation.

They are all small, scaling from seven to twelve pounds. The ears are very long and flowing, reaching nearly to the ground, and are heavily furred with long, silky hair. The coat throughout should be long and silky, straight or wavy, but never curly. They all have the bulby head, short muzzle, deep jaw, wide-set bulging eyes, dark and large pupil, showing the white when they look askance, which is much of the time.

Owing to the condensed face, their breathing is often faulty and asthmatic; owing to their surroundings they generally get fat and fussy; owing to their high price, the public is not greatly troubled with them; owing to their physical disabilities and the inherent weaknesses due to long generations of inbreeding, they are poor reproducers and hard to rear; and owing to their snobbish dispositions, they have never been popular, nor ever will be.

The King Charles is the pure black-and-tan type.

The tricolor, or Prince Charles, is black and tan with a large amount of white.

The Ruby is all deep rich red or mahogany bay.

The Blenheim is mainly "pearly white," with large, evenly distributed ruby or chestnut markings.

THE BRUSSELS GRIFFON

(For illustration, see page 255)

The origin of the Brussels griffon is in doubt. Some authorities say that he really

came from Brussels; others say that he originated in the coal mines of England. In any case, he is one of the funniest-looking dogs in the world, and has little to commend him to popular taste but his entirely bizarre appearance. His weight is below nine pounds, the best class having six pounds as a maximum.

The rather oversized round head is carried with an alert cockiness, and the perky expression is heightened by the bright, full, dark eyes. The muzzle is very short. The ears, if clipped, stand erect; if in their natural form they lop a little, being held semi-erect.

The most peculiar feature is perhaps the fringed beard, which gives the griffon a very human expression. The hair, red in color, is harsh and wiry. He should be a rather stockily built little animal, with straight, strong, though slender legs. He is a toy, pure and simple, however, and these qualities are rather the aim than the achievement of the breeders. In truth, he must, at present at least, be considered rather a grotesque, spindly little creature.

There is a smooth griffon and a larger "Brabançon," but they have never become known in this country.

THE DACHSHUND

(For illustration, see page 258)

The dachshund, or badger dog, combines to a high degree the qualities of the hound and the terrier, and probably both of these were used in his development, but where he got his crumpled legs is less apparent. He is the favorite dog of Germany, where his special work is to enter a badger hole and hold the attention of the animal until it can be dug out.

Badgers often work serious havoc in the cultivated fields, and they can dig their way through the ground so rapidly that it is very difficult for diggers to overtake one without the use of a dog. To follow this fierce, belligerent, and really dangerous animal into his burrow and drag him out requires a dog of great courage and tenacity, not to mention peculiar design. His long body, short legs, and large, outturned fore feet subject him to much ridicule, and it is often said that in Germany he is sold by the yard.

The dachshund usually seen in this country has a short and very silky coat, but there are also a long-haired and a rough-coated variety.

The well-formed dachshund should be three times as long, from nose to base of tail, as he is high at the shoulder. The head should be long and slender, but far from snipy, the nose running smoothly into the line of the forehead, with little depression at the top, and the occiput should be evident. The hound-like ears, combined with this more terrier-like head, give him an expression all his own.

The body and neck are long, but muscular and compact, entirely free from sagginess or weakness, and the tail is the true, tapering, terrier style, as nearly straight as may be.

The legs and feet are very important. While extremely short, they must be very strong and well boned. The fore legs, while bowed and twisted somewhat, must be strong, elbows out, wrists in, and feet turned out. The hind legs are to be strong and capable, and viewed from behind must go down straight and by no means show the turning in at the heel, known as cowhocks. This is very common and very bad. The thigh, when standing, goes down nearly straight; the shank (between stifle and hock) goes straight back horizontally, and the last joint, or rear pastern, is about vertical, parallel to the thigh. The feet are large, deep, and well padded.

They are generally black and tan, revealing the terrier strain here in the persistency of this dominant color-pattern. There are strains, however, of a whole-colored dark red tan, or "cherry," or even solid brown. The last named are not considered as good, and must be excellent in other respects to be given a favorable rating with the better-known colors.

In disposition they combine to an unusual degree the virtues of their respective ancestors, having the affectionate, companionable qualities of the hound and the tenacity, courage, and self-reliance of the terrier.

THE SCHIPPERKE

(For illustration, see page 258)

The schipperke got his name from being so frequently seen on the canal barges of Belgium, where he makes a good "watch" and keeps down the rats. The word is pronounced "skipperkee" and is the Flemish for "little skipper."

Doubtless an offshoot of the "wolfspitz," of Central Europe, this Belgian pet dog has attained a marked individuality, and really resembles no other dog at all closely.

He is a glossy, shining black all over, has a fox-like head, with rather small but very bright and intelligent eyes, a small, sharp nose, and erect, prick ears. The whole neck and breast are covered with an erect frill of longer hair, as are the back margins of the thighs. The shoulders and chest are deep and strong, and the well-tucked-up little body is firm and springy. The legs are light, but strong, and the feet small and dainty. The tail is a mere stump, or button, more than an inch being a disqualification. They are said to be born tailless, and probably some are. But it is easy to meet this requirement, and it is certain that not any grow up with a tail, however they started in.

The "little skipper" finds his congenial home on the canal-boats of Belgium and Holland, but has discovered a satisfactory substitute in the pampered homes of the rich in other countries. Like all spitz offshoots, he is bright, active, and affectionate, but just a little snobbish, and apt to be very jealous of any other pets in his household. He is a small dog, weighing about 12 pounds.

POODLES

(For illustration, see page 259)

The poodle is admitted to be among the most intelligent of dogs, and why he should have

AIREDALE TERRIER

BEDLINGTON TERRIER

POMERANIANS MALTESE TERRIER

been specially selected for the clown is hard to understand; but the fact remains that for hundreds of years it has been the custom to treat his coat in such a way as to make him ridiculous.

Either they clip his face, body, and legs, leaving ruffles about his paws, tie the hair on top of his head with a ribbon, and send him out looking like a little girl going to a party, or they partially clip him and allow the rest of the hair to grow long until it twists itself into cords which trail on the ground, making it practically impossible to keep the dog clean and sweet. Some owners tie these long cords in little bundles over the back to hold them out of the dirt, but fortunately the great difficulty in keeping the so-called "corded" poodle fit for exhibition is causing him to become less and less popular.

Thus the clever and adaptable poodle must forever, it seems, be made a clown when in reality he is one of the cleverest and most teachable of dogs. Incidentally, he has all the qualities of a first-class fowling dog: keen scent, good sight, venturous spirit, and an inveterate love for the water. In many ways, both physical and temperamental, he resembles the strong and capable old Irish water spaniel, and doubtless they have much in common.

The "Caniche," as the French rather affectionately call him, is the trick-dog *par excellence*. Every dog show or "animal act" is largely dependent on him for its best features and the "bad dog" is almost invariably of this type.

The pictures show the three best known variations. In any case, everybody knows a poodle, and it is a pity that this humorous fashion of making him look ridiculous should have the effect of hiding from most people the truly fine character that these dogs possess.

Physically he differs from the Irish water spaniel in being taller on his legs and generally slenderer; the muzzle is a little longer and there is a strong tendency toward beard and moustache which the clean-faced spaniel should never show. They may be black, brown, red, tawny, or white, but must be self-colored. The extravagant growth of woolly hair is a strange feature of the breed, particularly in the less-popular corded variety. The "toys" are governed (though less strictly) by the same standards as the bigger type. The eye, though small, is very bright and intelligent, and of all dogs these seem to enjoy most keenly the performance of tricks and capers taught by their masters. There is almost no limit to their capacity to learn. In Europe, heavier and more muscular strains of the breed are used as draught dogs, and in parts of Germany there is a strain used for herding sheep.

MEXICAN HAIRLESS

(For illustration, see page 259)

Every kind of a dog, however bizarre or degenerate, can find a human friend somewhere, and this most unprepossessing product of our unfortunate neighbor to the south is no exception. For unpleasant to the eye as he is, with his sausage-like exterior, weak, lashless eyes, and quivering drawn-in hind-quarters, he is said, by his friends, to be a bright and very affectionate little dog, which repays amply the care and regard of his master.

There seems to be a good deal of variation permissible as to size, form, and contour, so long as the prime misfortune of complete baldness be present. The best specimens, however, just to be bizarre, carry a topknot of silky white hair on their crown. In general they are like any medium-sized or small terrier whose hair has been scalded off.

The skin may be all pink, all dark purplish like old bologna, or a marbled combination of the two. The absence of a tempering coat of hair makes them feel unpleasantly fevered to the touch, and of course they are very sensitive to changes in the temperature and hence are rarely seen in the northern part of our country. For the "purposes of a dog" they are useless.

CHIHUAHUA

(For illustration, see page 259)

Probably no animal known to man has had so much nonsense and ignorant misconception written about it as this rather insignificant little Mexican product. Some writers have claimed for him part ancestry with squirrels, because he can scramble up the rough and straggly chaparral of his native State, or with the prairie-dog, from which he learns to dig his alleged burrow.

In cold fact he is just dog, and rather an ordinary dog at that, without any faintest trace of anything rodent-like in his entire physical make-up. It would be as natural to expect a hybrid between a bear and a beaver—or a wolf and a rabbit. All this kind of talk, in which animals of different orders are supposed to hybridize, is, of course, pure nonsense and utterly impossible, such as the widespread and generally credited raccoon and cat parentage of the so-called "Maine Coon-Cat."

The Chihuahua dog is simply a diminutive, spindly, prominent-eyed and apple-headed little terrier-like dog—*all* dog and *simply* dog. He is an affectionate and benign little creature, as most large-headed dogs are, and his physical characteristics are shown in the plate. No more mystery surrounds him than does any other dog. He is a good illustration of Mr. P. T. Barnum's well-known estimate of the public, which *likes* to be humbugged.

Full-grown specimens of this breed sometimes weigh less than a pound and a half and can stand comfortably on an outstretched hand; according to the standard, four pounds is the limit.

THE PUG

(For illustration, see page 263)

The pug was once a great favorite with those who like pet dogs, but he has long since

been supplanted by other and more attractive breeds.

Almost obsolete in America, at least, the pug is now most often encountered in his china image, which still graces the mantel in many a mid-Victorian home.

Mastiff colors characterize this curly tailed stocky, stiff-legged little dog, "apricot fawn," with black face and ears being the invariable rule except for the all-black variety, which was never popular here. On fawn dogs, a black "trace" down the back is very greatly prized.

The face is very short and cobby, the chest wide, neck short and loose of skin, and the legs straight and well boned, but not too heavy. The eyes are set wide apart and quite low. They are rather full and prominent. The ears are small, thin, and soft, and the coat is short, fine, and hard. They are clean, companionable dogs, with a tendency to get fat, blind, and asthmatic as they get old.

THE SAGACITY AND COURAGE OF DOGS

Instances of the Remarkable Intelligence and Unselfish Devotion of Man's Best Friend Among Dumb Animals

OTHER papers in this number of the GEOGRAPHIC have pictured the outward dog. They have shown the great gap between the stub-nosed, short-legged pug and the long-muzzled, lank-limbed greyhound. They have contrasted the bare-skinned, pocket-sized Chihuahua with the rough-coated, massive-built Newfoundland.

But this article attempts to portray the inner dog—its nature rather than its form. Could there be a greater gap than that existing between the tenacious bulldog that dares to die at grips with a foe and the timorous toy spaniel that would run from a rabbit? Or a greater divergence than between the pointer that, on the run, can tell the difference between the foot scent and the body scent of a quail yards away and the Pekingese whose nose would not tell him, standing still, the difference between a pig and a porcupine a pace distant?

How truly does Maeterlinck put it when he says that in all the immense crucible of nature there is not another living being that has shown the same suppleness of form or plasticity of spirit as that which we soon discover in the dog.

It is but natural that concerning a creature so faithful, a being so intimately identified with man's daily existence, an animal possessing so many and such varied qualities that appeal, there should have grown up a literature at once extensive and charming.

But even a casual examination of that literature reveals the fact that it is just as hard for a dog lover to be coldly scientific in telling of the deeds of his dog as it is for a fisherman to measure correctly the length and weight of the individuals that compose his catch.

Perhaps of all dogs the pointer and the setter deserve first rank, because of the exquisite development of their olfactory organs and their astonishing adjustment to the Nimrod's needs. Indeed, one scarcely knows which to admire the more, the immeasurable refinement of their sense of smell or their generalship in the field.

Galloping across a field at ten miles an hour, as he seeks living targets for his master's gun, amid a riot of odors and scents that range from the smell of decaying vegetation to the perfume of autumn flowers, and from the aroma of autumn grass to the body scents and foot tracks of mice and hares and small birds, a well-bred, well-trained pointer can detect a quail at ten paces or more. He can as unerringly pick out the one scent that is uppermost to his purpose as a trained musician can distinguish the one note he seeks in a score.

Not only does he know the quail scent from all others, but he knows the com-

JAPANESE SPANIEL YORKSHIRE TERRIER

PEKINGESE

KING CHARLES SPANIEL BRUSSELS GRIFFON

posite scent of several birds from the simple scent of one. Furthermore, he knows instantly the difference between the body scent and the foot scent of a bird. And, still further, he can invariably tell which way the foot scent leads. Did he take the heel of a trail instead of the toe, he would feel that he was surely coming to his second puppyhood.

Furthermore, such a dog can tell the difference between a dead and a wounded bird. If his master kills the quail outright, the dog, without hesitation, rushes in and retrieves it. But if it is only wounded, the dog as promptly comes to a point again and holds his position.

The bloodhound's ability to hit a trail and keep it is one of the marvels of nature. Hours may have passed since the tracks were made. The way may lead through a veritable mélange of odors—now down a road where sheep and cattle and hogs and horses have passed, now through a field where rabbits and mice and moles have played, and now, perchance, through a farmyard where chickens and ducks have tracked over every square foot—but the bloodhound goes on, without deviation, toward his quarry.

THE DELICACY OF A DOG'S NOSE

Of salt, man can perceive one part in 640 through his sense of taste; of quinine, one part in 152,000. Likewise, his optic nerve becomes conscious of a change of color when one part in 1,000,000 of methyl violet is added to colorless water. The delicacy of a man's olfactory nerve surpasses that of his optic nerve, as his optic nerve is more sensitive than the nerves of taste. One grain of musk will go on and on for days and weeks and even years permeating a whole room and writing the image of its odor upon the brain of man without apparent diminution.

Yet man's nose is as irresponsive to the scents that stir the trained dog to action as a hippopotamus is irresponsive to a dissertation on the fourth dimension. To what astonishing delicacy, therefore, must a dog's olfactory nerve attain to enable him to detect such infinitesimal emanations!

One cannot too highly extol the work of the hunting dog. As a recent writer says, "We all applaud the stiff antics of the high-school-trained horse and wax enthusiastic over the tricks of the lion-tamer's tawny pupil, but not one in fifty of us stops to reflect that the bird-dog displays an intelligence far beyond these. He ranges over the country as free as the winter wind, but always under perfect control. No bit guides him, yet he turns to the right or the left at the wave of a hand. No snapping whip compels obedience, but he obeys the call of a whistle promptly and cheerfully."

DOGS THAT OVERCOME PRIMITIVE PASSIONS

Another writer, along the same line, says: "Consider the wonderful self-control of the pointer. If the savage tiger or the docile cow could be taught such perfect obedience, science would investigate the case as abnormal; but no one considers it strange in a dog. The pointing habit is only the momentary pause before the wild dog springs upon his prey, developed by long training and selective breeding until it is stronger than the natural instinct. Think what self-control is demanded to stand staunch when the bird flushes, and what a hold on primitive passions to pick up the bird and return it gently to the master."

Men often become devoted to their hunting dogs and write about them in the most striking terms. A gem that has a fugitive place in a sporting journal thus describes two hunting dogs: "Old Joe is a strapping, lemon-marked dog, with a heavy head and a tail like a couple of feet of garden hose. But he is a mighty hunter, as sedate as a senior deacon, and as serious as a professor of Sanskrit. Queen is a common-looking little rat, light and racy, thin as a match-stick and as nervous as the needle of a pocket compass."

SOME MARVELOUS TALES

As before stated, the stories of exceptional intelligence in dogs are without number; but, alas, many of these seem to reflect the enthusiasm of the dog lover rather than the observations of the cold seeker after truth. The London *Spec-*

tator some years ago published a book filled from cover to cover with claimed-to-be-authentic stories of dogs. One story published told of an old mastiff that, wanting a fresh egg for dinner, caught a hen and carried her to his kennel, where he kept her a prisoner until she laid one, after which captor and captive became inseparable friends.

Another story alleged that a Dr. Barford's dog was muzzled, but managed to get out of the nosepiece, which he promptly hid. A policeman found him and summoned his master to court. The children of the family told the dog how wicked he had been to get his master into so much trouble, and added the information that he, too, would have to appear in court on a given day. Later the case was postponed, but the dog was in court as per schedule.

Then there is the story of a dog which, on being rewarded with a bun for rescuing a drowning child, pushed another into the water so that he might get another bun. Still another story has it that a man on a walking tour in the Maine woods left his note-book at a lodge. He didn't have time to go back for it, so the lodgekeeper held the tourist's glove to the dog's nose and commanded him to go back to the camp and get the book. In due time the dog was back with the forgotten diary.

A DOG THAT BROUGHT AN INJURED PAL TO A PHYSICIAN

Another story relates that a bulldog owned by a tavern-keeper followed his master to a surgeon's office and watched the latter set a broken arm for his master. After several weeks the surgeon heard a scratching at his door. Upon opening it he found the self-same bulldog with a canine pal that needed a leg set.

Another veracious gentleman vouches for this story: One night he was waylaid by "Sweep," an Australian collie, whose master was a friend of his. The dog took his hand in his mouth, and gently but firmly attempted to lead him away. Although provoked, he decided to follow the dog, which piloted the way to the ferry, where he was requested in dog language to buy a ferry ticket that would permit the collie to cross the river.

These are but samples of an endless array of stories of dog intelligence, every one solemnly vouched for, that fill the literature concerning dogs. The pity is that men who tell such stories seriously tend to discredit actual instances of intelligence on the part of these faithful animals.

THE DOG'S MANIFOLD DUTIES AT THE BATTLE FRONT

The stories of the devotion of dogs to their masters under the most trying conditions of the battle front form one of the epics of the great struggle.

It is said that there were about ten thousand dogs employed at the battle front at the time of the signing of the armistice. They ranged from Alaskan malamute to St. Bernard and from Scotch collie to fox terrier. Many of them were placed on the regimental rosters like soldiers. In the trenches they shared all the perils and hardships of the soldiers themselves, and drew their turns in the rest camps in the same fashion. But they were always ready to go back, and it is not recorded that a single one of them ever failed when it came to "going over the top" (see also page 201).

The Red Cross dogs rendered invaluable service in feeding and aiding the wounded. Each one carried a first-aid kit either strapped to its collar or in a small saddle pouch. When they found a soldier who was unconscious, they were taught to bring back his helmet, handkerchief, or some other small article as a token of the discovery. Many of them learned wholly to ignore the dead, but to bark loudly whenever they came upon a wounded man.

Not only did the dog figure gloriously as a messenger of mercy in the war, but did his bit nobly as a sentinel in the trenches. Mounting guard at a listening post for long hours at a stretch, ignoring danger with all the stolidness of a stoic, yet alert every moment, he played an heroic rôle.

Full many a time it was the keen ear of a collie that first caught the sound of the approaching raiding party. And did

DACHSHUND

BELGIAN SCHIPPERKE

CURLY POODLE TOY POODLE CORDED POODLE

CHIHUAHUA MEXICAN HAIRLESS

Photograph by William Reid

FIVE FRIENDS ON A SEE-SAW: SCOTLAND

The dog is man's oldest friend among the animals, and the one with whom he most willingly trusts his children. Both as playfellow and as protector, the dog has for centuries been a loved and loving member of countless households.

he bark? How natural it would have been for him to do so! But no, a bark or a growl might have told the raiders they were discovered, and thus have prevented the animal's own forces from giving the foe a counter-surprise. So he wagged his tail nervously—a canine adaptation of the wig-wag system which his master interpreted and acted upon, to the discomfiture of the enemy.

Often whole companies were saved because the dog could reach further into the distance with his senses than could the soldiers themselves.

It was found that many dogs would do patrol and scout duty with any detachment. But there was another type of dog worker needed in the trenches—the liaison dog, trained to seek his master whenever turned loose. Amid exploding shells, through veritable fields of hell, he would crawl and creep, with only one thought—to reach his master. Nor would he stop until the object of his search was attained. Many a message of prime importance he thus bore from one part of the field to another, and nought but death or overcoming wound could turn him aside (see pages 186-190).

But the work of the dogs of war was not limited to the front. Where the motor lorry was helpless, where the horse stood powerless to aid, where man himself found conditions which even the iron muscle and the indomitable will that is born of the fine frenzy of patriotism could not conquer, here came the sled dog to the rescue.

Alaska and Labrador contributed the motive power for the sleds that kept the men in their mountain-pinnacle trenches in the high Alps provisioned and munitioned in the dead of winter. In four days, after a very heavy snowfall, one kennel of 150 dogs moved more than fifty tons of food and other supplies from the

valley below to the front line on the mountain above.

In the Vosges Mountains more than a thousand Alaskan sled dogs helped to hold the Hun during the last year of the war.

DOG TEAMS THAT WON THE CROIX DE GUERRE

One woman brought back to America a Croix de Guerre awarded by France to her intrepid teams of sled dogs. The occasion that won them that honor was their salvation of a storm-bound, foe-pressed outpost in the French Alps. Dispatch bearers had been sent back repeatedly, but no succoring answer came, for the messengers were overwhelmed as they passed through the blinding blizzard.

At last matters became desperate. The foe was pressing his advantage with dash and courage, and nothing but quick action could save the situation. So Lieutenant Rene Haas hitched his dogs to a light sled and started through a blizzard before which human flesh, in spite of the "urge" of a consecrated patriotism, had failed. In "sweepstakes racing time" they covered the trip down the mountain and over a perilous pass to the main army post.

There the 28 dogs were hitched to 14 light sleds, and these were loaded with ammunition. Back over the forbidding trail they went, under an artillery fire, facing a bitter wind, and plowing through blinding clouds of snow. On the fifth day, at sunrise, the panting malamutes reached the outpost, their burden of ammunition was rushed to the gunners, and the mountain was saved from the insolent foe.

The stories of courage and bravery among individual dogs on the battlefield are many and inspiring. Michael was the name of a dog which, unaided, dragged his master, who had been left for dead in No Man's Land, back to the trenches. Lutz, the dog hero of Verdun, was awarded the war cross star for his work as an advanced sentinel. Nellie, a fox

Photograph by Harry F. Blanchard

FRIENDS THROUGH SUNSHINE AND SHOWERS

From their present state of mutual trust and comradeship, it is difficult to picture the age when the forebears of these three playmates were bitter antagonists—the cave-man and the wolf.

SCOTTISH TERRIER WEST HIGHLAND WHITE TERRIER SKYE TERRIER

WHIPPETS

PUGS

terrier that followed her master through the rain of shot and shell at the first battle of Ypres and afterward adopted a Belgian regiment, was wounded by shrapnel twice, but continued to "go over the top" until brought to America by the Belgian Mission.

Fend l'Air, a black and white setter, partially dug his master out when he was buried by a shell explosion, and remained with him for three days and nights, until he was rescued. Follette, of the Tenth French Army, traveled a mile under a curtain of fire, and, although wounded, continued on her mission. She died of her wounds five days later.

Filax, a sheep dog, failed to win a prize at the New York dog show a few years ago, being pronounced "somewhat too coarse for show purposes." His master thereupon put him into Red Cross work. Braving the dangers of No Man's Land on innumerable occasions, he saved the lives of a hundred wounded French soldiers.

Whose eyes have not floated in seas of tears as the story of good dog Barry, that noble old St. Bernard that saved 40 lives, has been read? Yet there are thousands of good dogs Barry in the world. Rex, a St. Bernard, rescued two boys from the undertow at Fort Hamilton in 1899. Happy, an Airedale, rescued Jack, a fox terrier, from a raging mountain torrent in the Adirondacks some years ago. Stranger and friend, man and beast, have each in their turn known what it is to be rescued from flood and fire by faithful dogs.

FAMOUS DOG ACTORS

Dogs have long played an interesting rôle as actors on the stage. For instance, there is Teddy, seen in the Mack Sennett comedies. It is said among the players at the Sennett laboratories that Teddy never wagged his tail in his life, and that it would be as much of a surprise at the studio to see him do so as it would in Washington to see a sedate justice of the Supreme Court skip a rope. He does as he is told as painstakingly as the most conscientious actor who ever posed before the clicking camera, but if he has ever enjoyed the experience or felt bored, his demeanor has never registered that fact.

Jasper is another celebrated canine actor. He has entertained a President, visited with a cardinal, showed a Supreme Court justice what a dog can do, and has thrilled his tens of thousands with his acting in "Young America." Jasper is a 35-pound brindle bull.

Shep, in "The Road to Happiness," played his rôle for three years without missing a rehearsal or performance, while Jack, in "The Little Shepherd of Kingdom Come," distinguished himself by his ability to portray before the footlights the faithful devotion of a dog for his master. Both have a rival in the great Dane that played the second lead with Mabel Taliaferro in "The Price She Paid." Another famous dog actor is Michael, owned by Laurette Taylor, whose touching rôle in "Peg o' My Heart" will be recalled by every one who saw that appealing comedy.

NOTED GLOBE-TROTTING DOGS

Many dogs have developed a fondness for traveling, acknowledging as master for the moment any one who would help them on their way. An antipodean example of the traveling dog was Bob, whose stuffed form now graces an Australian museum. Born in the rabbit country, he later attached himself to a railroad employee, and began to ride on the tender of a locomotive. His license was always bought and paid for by the men, and his collar bore the inscription, "Stop me not, but let me jog; I am Bob, the drivers' dog."

But eclipsing all records as a traveler was Owney, the Railway Postal Clerks' dog. In his puppyhood Owney adopted the post-office staff at Albany, New York. One day he went down to the train with a mail wagon and decided he would go out with the boys in the postal car. He went, and he liked seeing the world so well that the wanderlust got the better of him. Finally, the Albany post-office clerks decided to ask the men to tag him on every run he made, with the result that before long it was found that Owney had visited every big city in the United

LARGE FAMILIES ARE THE RULE IN THRIFTY SCOTCH KENNELS

Photographs by William Reid

THEIR ANCESTORS CAME FROM THE CELESTIAL KINGDOM

Each of these Chow, or Chow-Chow, puppies, when it arrives at dog's estate, will be a frisky, intelligent, and obedient companion for its owner—and none other. The Chow is not sociably inclined; it is indifferent to all the world save to him whom it acknowledges as master (see page 225).

Photograph by William Reid

"WE ARE SEVEN"

A Scotch lassie and her half-dozen setter puppies.

States, with side trips to Mexico and Canada.

When he reached Washington, he called on the Postmaster General, who ordered a harness to take the place of his overloaded collar. After some further traveling he went to San Francisco, where he was awarded a medal and fitted out with a regular traveling bag, in which to carry his blanket, comb and brush, harness and credentials. Thus duly equipped, he took passage on the steamship *Victoria,* as the guest of Captain Panton. Arriving at Yokohama, he was given the freedom of the Japanese Empire under the personal seal of the Mikado. After doing Japan in regulation distinguished-visitor style, he then went to Foochow, where he was entertained aboard the U. S. S. *Detroit,* dining on lobscouse and plum duff in the mess-room.

Thence Owney went to Hongkong, received a personal passport from the Chinese Emperor, and then headed for Singapore, Suez, and Western Europe.

Photograph by Edith S. Watson

DOGS DO THEIR FARM AND HOUSEHOLD BIT IN CANADA AS WELL AS IN BELGIUM AND HOLLAND—A SCENE IN PERCÉ, PROVINCE OF QUEBEC

Eventually he took return passage to America. Upon his arrival in New York he was "interviewed" by reporters of the metropolitan newspapers, but the lure of Broadway was short-lived. He hastened on to Tacoma and thus completed his trip around the world in 132 days, carrying more than 200 new medals, tags, and certificates as testimonials of his travels.

When Owney died every postal clerk in America lamented his death. His stuffed skin, accoutred in all the trappings of his travels, is mounted in the Post-Office Department Museum in the city of Washington.

The most recent departure in canine traveling is accredited to a dog by the name of Flock. Marcel Therouin, an aviator sent to reconnoiter a district in Serbia, saw a small boy clinging to the dead body of his father and weeping piteously, for he alone of the population of the neighborhood had been spared. A dog crouched beside the boy. Therouin decided to rescue the lad and strapped him in the airplane. The dog howled so piteously at the prospect of being left entirely alone that the aviator took him aboard also. Ever since the dog and the aviator have been inseparable friends. When he goes up, the dog lies curled at his master's feet and never budges during the flight.

A DOG UNDER A FLAG OF TRUCE

One might write a whole article on the dogs of famous men. George Washington maintained a pack of foxhounds at Mt. Vernon, and after the close of the war was constantly making reference to them and the chase, in his well-kept diary. In the Memoirs of Chevalier de Pontiband a fascinating story of the Revolutionary War is told, showing how great military leaders respect one another. One evening while at dinner a very fine sporting dog, as hungry as he was good looking, came into the presence of General Washington. Examining the collar, the General found it bore the name "General Howe." After feeding the dog well, he sent him back to his owner under a flag of truce, and received a letter of thanks from General Howe in acknowledgment of his kindness.

Photograph by William Reid

THERE ARE MANY ARISTOCRATS IN THE CANINE WORLD, BUT THE SCOTCH COLLIE IS THE HONEST YEOMAN OF THE RACE

The sheep-dog has few rivals in usefulness. Its intelligence is phenomenal and its industry indefatigable. The story is told of an American shepherd who died in a lonely cottage, his body lying undiscovered for two days. In the meantime, his two dogs took charge of the flocks, driving them to pasture in the mornings, standing guard all day, to prevent molestation or straying, and driving them to the sheepfold at night.

© F. O. Koch

A PHILIPPINE LIVE-STOCK MARKET

The Igorrotes are among the few tribes of the earth that habitually eat dog flesh.

A DOG THAT TOOK PRECEDENCE OVER NINE KINGS

Everybody, of course, knows the story of the little wire-haired terrier that was the favorite of King Edward VII of Great Britain. On his collar was the inscription "I am Cæsar, and I belong to the King." When that sovereign died, his favorite charger and his best loved dog marched in the procession just behind the King's coffin. Each was led by a Highlander, and Cæsar took precedence over nine kings and nearly all the princes of the earth (see page 278).

Pompey, a spaniel, "adopted a prince." He attached himself to the suite of William the Silent, in spite of all the efforts of the prince's retainers. Later he gave warning of a surprise attack on his royal master's camp in time to thwart it, and was credited by his sovereign with having saved his life. On the monument of William the Silent, at the Church of St. Ursula, in Delft, Pompey is carved lying at his master's feet.

In all dogdom there are no more interesting animals than those of the Polar regions. The man who observed that dogs make the Northern world go round told a big story in little compass. So important are their services that the Commander of the Department of the Columbia recommended some time ago that a system of pensions for those in the employ of the Government be established.

Discussing the subject, he said that during a tour of inspection he was distressed by the present practice of turning the old and disabled dogs adrift. "They afford the only line of communication between many of the army posts," said he, "there being three hundred of them constantly in the service."

The man who has been served faithfully by one of these animals cannot have the heart to kill him, and yet it is an expensive business keeping dogs that cannot make their way in such regions.

Is a Pole to be discovered, man stands powerless before the ice and the snow

Photograph by William Reid

A YOUNG GAME-KEEPER AND HIS NINE ASSISTANTS: ABERFOYLE, SCOTLAND

These magnificent hunting dogs of the Highlands are natives of the Rob Roy country. In death as well as in life, the dog serves his master; during the world war, dog-fur and dog-skin were in constant demand. American aviators on the Western Front were supplied with coats made of Chinese dog-skin, as these were found to be warmer, lighter, and more durable than any others.

THE OFFSPRING OF A TIMBER WOLF AND COLLIE DOG

During the winter of 1917 wolf tracks were observed leading from the south shore of Lake Superior across the ice to Grand Island, one of the finest game preserves east of the Mississippi. Several days later some carcasses of deer were found, and a trap was placed near the remains. The next day one of the game protectors found an animal struggling in the trap and he killed it before having a chance to examine the animal. While looking much like a timber wolf, the hair was longer and finer, the legs and tail being feathered much like that of a collie dog. It is the opinion of those examining the mounted specimen that it was a hybrid of dog and wolf. The animal accompanying it was undoubtedly a timber wolf. Photograph and note by George Shiras, 3rd.

without the dogs of the North. Is an expedition to reach the interior of a bleak region in dead of winter to rescue some hapless explorer or pioneer, or to help an ice-besieged population fight an epidemic of fever or smallpox, then the sleds and the dogs make the trip possible. .

In some parts of the Frozen North dogs are laden with packs instead of hitched to sleds, and it is surprising what burdens they can bear. Stefansson often used dogs in this way.

Many a traveler has told of the dread of dogs for rushing waters, and has recited how, as they approach the icy torrent of a mountain stream, they make the welkin ring with their dismal howling.

But once across, the dismal howl is succeeded by the joyous bark, and it is said to be one of the striking incidents of the wilderness of frost to hear half a pack on one side of a stream lugubriously bemoaning the ordeal ahead and the half pack on the other side gleefully celebrating a safe passage.

DOG-RACING IN THE FAR NORTH

One of the principal sports of the Far North is dog-racing. The annual All-Alaska Dog Race is the classic sporting event of King Frost's dominions. A 412-mile run over snow and ice, from Nome to Candle and return, calls for phenomenal endurance. Usually it is a contest between the Alaskan malamutes and the Siberian wolf-dogs, and the rivalry is as keen as that displayed in a baseball world's series. Four years out of seven the sweepstakes went to the Siberian wolf-dogs. In a recent year one of these teams made the round-trip in 80 hours and 27 minutes.

The Red River International Derby is another race that tries the mettle of the

© Donald McLeish

A LIFE-SAVING ST. BERNARD AND HIS MASTER AT THE HISTORIC STEPS OF THE ST. BERNARD MONASTERY: SWITZERLAND

One of the most famous dogs of modern times was a St. Bernard—Barry. Among the 40 lives saved by him was a child found in the snow and overcome with the drowsiness which precedes death by freezing. The dog restored the child to consciousness by licking its face; then crouched in the snow so that the little sufferer might climb upon him and be carried to the monastery on dogback. Over Barry's grave is the inscription: "Barry, the heroic. Saved 40 persons and was killed by the 41st." The tragedy was due to an unfortunate mistake, a lost traveler thinking that his dog rescuer was about to attack him.

dogs of the North. This race is run over the Pembina trail, from Winnipeg to St. Paul. It is a straightaway course nearly 500 miles long. When Albert Campbell, the Cree Indian, drove his team of six dogs across the finish line at St. Paul, making the 522 miles in 118 hours and 16 seconds, he won the longest dog-race ever held and set a Marathon mark that will be hard to lower.

The dogs of the Far North are devoted to their masters, but the eternal cold and the unbroken solitude of the lonely places within the Circle often make the devo-

Photograph by Lomen Brothers, from Capt. Thomas A. Ross

MERELY BECAUSE THERE ARE NO HORSES, JOCKEYS, OR RACE TRACKS IN ALASKA IS NO REASON WHY NOME SHOULD NOT HAVE ITS RACES

In no other part of the world is the rivalry keener than between owner-driven teams of sled dogs in the far north. Women not infrequently enter the lists, as shown in this picture (see text, page 271).

tion mutual. When Lieut. George F. Waugh, of the United States Army, was making that lonely trip from the Canadian frontier to the Bering Sea coast, the story of which is told in his "Alone Across Alaska," he met a man carrying five small puppies. He was three days making twelve miles, two of them without a bit of food. He had frozen his feet and hands, but the puppies had to be cared for, whatever the odds.

Another striking case of devotion to one's dog is related of Captain Robert Bartlett, now planning an aërial expedition to the North Pole. He was in command of the *Karluk* when the ship was caught in drift ice and carried helplessly on to her doom and away from Stefansson, whose expedition she was carrying. After the brave old craft at last surrendered to the shearing process of the ice and had gone down with her talking-machine playing the funeral march, it became Captain Bartlett's duty to bring relief to the members of the ice-stranded party. So he first saw them to reason-

© Lomen Brothers

DOGS OF THE NORTH

It was upon such teams of valiant animals as these that Peary relied in his dash to the North Pole. The Eskimo dog has played a notable part in Arctic and Antarctic explorations under many flags. During the world war a team of sled dogs was awarded the Croix de Guerre for saving a French outpost in the snow-covered Alps (see page 261).

Photograph from Department of Agriculture

REMAINS OF 193 SHEEP KILLED IN A SINGLE NIGHT BY TWO DOGS

The best friends of the dog are the most earnest advocates of legislation against the renegade of his race—the sheep-killing mongrel. And when a pedigreed dog runs amuck he is even worse than his nondescript fellow-sinner.

able safety on a lonely island, and then, with his dogs and one Eskimo, set out for civilization again. En route, his leading dog, in trying to jump an ice-lane, fell into the water. He was quickly rescued, but the sea-water on his hair almost immediately became ice. To save the dog from freezing, the two men successfully chewed the ice out of their four-footed ally's coat.

SHEEP-KILLERS—THE PARIAHS OF DOGKIND

NOT the vivid oratory of a Vest, nor the lovable brush of a Landseer, nor yet the blazing eloquence of a Byron has served to overdraw the picture of the well-bred, well-trained dog.

But those friends of the dog who are most jealous of his good name are among the first to advocate legislation that will at once protect the public from the evil deeds of the pervert of his kind and the good dog from maledictions he does not deserve.

In these days, when wool is so high that one has to wonder whether it was not the sheep instead of the cow that jumped over the moon; in these times, when a hungry world abroad and a diminishing meat area at home alike call loudly for new meat production, the nation suddenly awakes to the fact that the

farm east of the Missouri River having a flock of sheep is the exception and not the rule. And why?

Not because sheep-raising is naturally unprofitable. Presenting her owner with a fine lamb or two every spring, giving him a nice fleece of wool at the beginning of each summer, and yielding a goodly lot of savory mutton at the end of her career, a good ewe is no mean investment, normally.

If the farmer has a field overrun with briars, a flock of sheep will do the work of two or three grubbing-hoes. They will live where cattle would starve, and thrive on grass too short for anything else except goose pasture. The farmer loves a flock of sheep about the place. Then why does he not have them?

THE FARMER'S PLAINT

Here is his own answer:

"Only a few days ago the last of my sheep were driven away. I watched those old Merino ewes and their foldy-necked lambs walk down the road and out of sight, and, as I watched, a lump came into my throat and the tears were not far away.

"Now these ewes are gone. Because I have lost interest? Far from it! I would walk farther to see a good Merino than any other animal that lives. Because I think tariff changes have knocked the industry into a cocked hat? No, for I think the future of the industry is bright, and that the "golden hoof" will be worth as much—perhaps more—in the future as in the past. Then why? The one reason for present abandonment would be shouted by thousands of shepherds if the question were put—just dogs!

"Old stuff? Maybe to you, but it's ever new to the sheepmen of eastern Ohio, Pennsylvania, and West Virginia, and to flock owners everywhere. The man who has walked out to his pasture and found dead, torn, crippled, bleeding, scared sheep will appreciate what I say.

"My farm is bounded on two sides by small towns, with a joint dog population of two hundred; one mile away, on the third side, is still another village, and two miles in the remaining direction is a fourth—the last two with more dogs than people. We found our sheep dead; we found them with throats cut and legs torn off; we found them one time huddled together in the farthest corner of the field, another time scared into the public highway, and, again, chased four miles from home.

"The foreigners' dogs chased them; the neighbors' dogs chased them; dogs of all kinds, seen and unseen, had a whack at my Merinos.

" 'Why don't you shoot the marauders?' queries one. 'Why don't you poison them?' another asks. And 'Why don't you keep your sheep at the barn?' another wants to know.

"But can a farmer who gets up at half-past four in the morning, finishing his chores, eating his breakfast, and reaching the field by seven, sit up all night waiting for the dogs? Or do you expect him to violate the law that prohibits the setting of poison? Or should he, after having followed a plow from sun-up to sun-down, have to drive his sheep in every night and out every morning?"

A HUNDRED THOUSAND SHEEP KILLED ANNUALLY BY DOGS

Alas! how many farmers who loved to have gentle-faced, soft-bleating sheep and gamboling lambs around the place have given a negative answer after trial, and how many others have been deterred from sheep-raising by seeing the ravages of the unrestricted dog in some neighbor's flock!

The Department of Agriculture estimates that more than one hundred thousand sheep are annually sacrificed by the unrestricted dog. Some dogs kill one or two, others continue the attack until all the sheep are destroyed or crippled. Still others chase the flock till its members die from exhaustion.

Many of the States have laws under which taxes on dogs go into funds for the reimbursement of farmers for sheep killed or crippled. But the appraisers cannot take cognizance of the damage done to those members of the flock that escape actual destruction or injury from the teeth of the attacking brutes.

The dogs work both singly and in

Photograph by Public Ledger Service

POLICE DOG IN ACTION AT A TRAINING STATION

Until recent years, it was the bloodhound which invariably was associated in the public mind with the capture of criminals, but nowadays it is the police dog which is the animal guardian of law and order. Bold, indeed, is the burglar who will brave so tenacious and courageous an assailant as a well-trained dog of the breed here shown. A "graduate" dog of a training station is an important asset to any metropolitan police department.

Photograph by Paul Thompson

CÆSAR, THE FAVORITE DOG OF KING EDWARD VII, MARCHING BEFORE THE FOREMOST KINGS AND PRINCES OF THE EARTH IN THE FUNERAL PROCESSION OF HIS MASTER (SEE TEXT, PAGE 269)

groups in attacking sheep, and often travel for miles. One sheep-killing dog can soon lead astray his associates of a whole neighborhood. Usually such a dog has no countenance, and the phrase "he looked like a sheep-killing dog," so often used by countrymen to describe some fellow's lack of ability to look another in the eye, is an expressive one to those who have seen such an animal.

Many suggestions have been advanced for overcoming the attacks of dogs upon flocks. One of these is that the sheep be driven to a sheepfold every night—a burdensome measure.

Another suggestion is that dog-tight fences be built. Such fences call for barbed wire at the bottom and the top, and any one who has seen horses cut to pieces in such a fence wonders whether there are not better means.

Some farmers have improved conditions by teaching their young dogs to respect the sheep and the sheep to defend themselves. It is striking how much respect for the prowess of a ram can be put into a puppy by two or three vigorous buttings from his ramship; but not less surprising how much courage an old ram can muster who has taught a puppy or two their place.

The dogs that are homeless and the ones that are permitted out of bounds are a menace not only to the sheep industry, but to the health of man and beast as well. So great is this menace that the United States Department of Agriculture says there is a growing conviction that while his innate qualities and the fund of affectionate sentiment which attaches to him warrant the preservation of the dog with a responsible owner, who will keep him clean and free from vermin of all sorts, holding him within reasonable bounds and restraint and assuming responsibility for his acts, on the other hand, the ownerless dog, the dog that carries vermin and disease, the dog that kills sheep or destroys property of any sort—the trespassing dog—must be eliminated.

DISEASES SPREAD BY DOGS

Dogs spread many diseases—most terrible of these being rabies. In a recent year 111 human beings in the United States died of hydrophobia. Tens of thousands of dogs suffering from this disease are killed, and yet there is no excuse for its existence. Years ago the disease became so general in England as to amount to a national menace. A stringent muzzling law was enacted, its terms enforced, and a quarantine on imported dogs established, with the result that the disease has entirely disappeared from the country, the only case that has occurred since 1902 being that of an imported dog held in a six months' quarantine.

Australia and New Zealand have a similar quarantine, and the disease has never reached those lands. The man who asserts that it is the populace and not the dog that goes mad when there is a rabies scare should recall that the same conditions prevailed in England until the enactment of the muzzling and quarantine law.

Other diseases which the wandering dog is known to spread are hyatid and gid, both worm complaints, the first affecting the liver, kidneys, brain, and lungs, and the other attacking the brain and spinal cord of farm animals; tapeworm, which attacks man and beast alike, roundworm, etc.

A MODEL LAW FOR PROTECTION OF AND AGAINST DOGS

The United States Department of Agriculture has collected all of the clauses in all of the State laws that have proved their merit under the test of time and has formulated them into a model dog law, which it recommends to the consideration of all true friends of the dog—friends who believe in perpetuating the good that is in dogs and in eradicating the evil.

This model law embodies the idea that the tax assessor should list the dogs; that unspayed females should be subject to a high tax; that all dogs should be required to wear collars and tags bearing the names of their owners; that all dogs, unless under leash or reasonable control of their owners, should be confined from sunset to sunrise; that sheep-killing dogs may be killed by any one, without liability to owner; that any dog running at

large upon the enclosed lands of a person other than the owner of the dog may be killed, at the time of finding him, by the owner of the land, his agent, tenant, or employee; that dog owners shall be liable to the county for all money paid out for damages done by their dogs; that sheep owners may set out poison on their farms after public notice of such intention.

Such a law aims as much at the protection of the dog that is entitled to a good name, and has an owner who knows and lives up to his responsibilities, as it is for the protection of the community itself. It espouses the cause of the good dog against the homeless, ill-kept wretches that are as much a misery to themselves as they are an evil to the community.

The law has regard for every right of every owner of a dog who respects his neighbors' rights, and seeks only to curb the carelessness of that owner who has a dog—whether pedigreed or mongrel—that is allowed out of bounds. And, in passing, it must not be forgotten that the only thing worse than a mongrel out of bounds is a pedigreed animal running amuck; for blooded dogs are more intense in their make-up than the mongrel, and therefore more destructive when they "go off the reservation."

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THE CONE-DWELLERS OF ASIA MINOR*

A Primitive People Who Live in Nature-Made Apartment Houses, Fashioned by Volcanic Violence and Trickling Streams

BY J. R. SITLINGTON STERRETT

The author of the following account of the Troglodytes of Cappadocia stood at the head of American geographers whose researches in Asia Minor have revealed to modern man many pages in the absorbing history of the human race. His death occurred at a time when he was completing arrangements for another expedition of greater magnitude than any he had previously undertaken. Dr. Sterrett's photographs illustrating this article afford the only comprehensive idea of the cone-dwellings—formed by the forces of nature, but excavated by the Troglodytes—yet given to the Western World.

IT IS a curious paradox in the history of human migrations and human development that in that very land which historians and geographers characterize as "the cradle of civilization" there is to be found today a people whose mode of living is, in one of its basic principles, more primitive than that of the most benighted tribes of Africa or the South Pacific, remote from the warming and enlightening influence of modern thought and progress.

Residing within a stone's throw, metaphorically speaking, of the wonderful civilization which flourished on the banks of the Nile 6,000 years ago; of the mighty kingdoms of Assyria and Babylonia which arose in the valleys of the Euphrates and the Tigris, their power and splendor dazzling the world 2,000 years before the Christian era; and at the very threshold of ancient Greece, with its unrivaled culture and political advancement, the Troglodytes of Cappadocia still retain toward their fellow-men an attitude of mind akin to that which obtained in the Stone Age, when there was no such thing as human society, but every man was his own law and the mortal enemy of his neighbor.

The only difference between the society of these Troglodytes and that of primitive man consists in this, that primitive man did not brook the presence of any other man, while here the isolation of the clan takes the place of the isolation of the individual.

CONES CLUSTER AROUND EXTINCT VOLCANO

The caves, cones, and cliff dwellings of the Cappadocian Troglodytes of both

* See also, in the NATIONAL GEOGRAPHIC MAGAZINE, "The Mole Men: An Account of the Troglodytes of Southern Tunisia," September, 1911, and "China's Treasures," including a description of the cliff temples of Lung-Men, October, 1912.

THEIR PALACES WERE PINNACLES

The face of one of these cones is so badly broken away that many of the interior chambers are exposed, and we can see that this cone on the right had nine stories. Most of the cones are literally honeycombed until they are mere shells. This is a typical scene, showing the conjunction of barren and fertile country.

THIS PHOTOGRAPH IS INTENDED TO CONVEY A VIVID IMPRESSION OF THE UNEXCAVATED CONE IN ITS SEMI-PRISTINE BEAUTY

It originally had a cap and was very much larger than it is now. After its cap of lava had fallen off, in consequence of the rotting of the stone under the weathering of millennia, the cone rapidly decreased in size.

ancient and modern times are to be found in greatest number in the shadow of Asia Minor's loftiest peak, snow-clad Mt. Argæus (called by the Turks Erjias Dagh), an extinct volcano whose eruption in the dim past laid the foundations and supplied the material for these remarkable habitations, while the Halys River of the ancients (now known as Kizil Irmak) in succeeding centuries became their tireless architect (see text, page 318, and map, page 315).

The practice of living in caves, in cliffs, or in excavated cavities in the open plain is to be traced to a state of society which we of today have some difficulty in depicting to ourselves. And yet the central thought of the Troglodytic* habit is the basic principle upon which ancient civilization was founded.

That basic thought was absolute isolation—a thought which is wholly antagonistic to our modern conceptions of society, whether we have in mind the community of a country-side, a village, a town, or a State; because, where absolute isolation is the dominant obsession

* The term *troglodyte* is a Greek compound word, whose first element, *trogle*, means "hole," while its second element is derived from the verb *duo*, which means "to go, get, dive, or plunge into." Hence, a troglodyte is a man who goes into a hole—lives in a hole.

THE HEIGHT OF THE CONES VARIES VERY MUCH, RANGING FROM FIFTY TO THREE HUNDRED FEET

One of the older travelers puts the extreme height at four hundred feet, which is regarded as an overestimate, though it is difficult to judge height accurately by the unaided eye. Note the dwellings in the cones.

IN MANY CASES, AS IN THIS ILLUSTRATION, THE ENTRANCE IS HIGH ABOVE THE GROUND

Ingress is attained by means of two parallel and perpendicular rows of holes, cut at regular intervals, so that one had to climb to the door of the house by using both hands and feet. In this fine cone we have two separate dwellings, as the finger-and-toe holes of entrance show. The great height of these cones is clearly shown by comparison with the trees (see illustration, page 293).

THE CENTER OF THESE WHITE CONES IS UDJ ASSARÜ, A HUGE MASS OF PUMICE-STONE WHICH LIFTS ITS LOFTY HEAD IN THE MIDST OF MANY BRANCHING VALLEYS, SUCH AS ARE SHOWN ON PAGES 290, 296, AND 316

The name means "the Castle of Udj," but it is not known whether Udj is the name of a princeling or that of a place or district. The earlier travelers called this mass Uetch Hissar, "three castles." It is honeycombed with vast chambers excavated by man in the remote past. Note the women in the right foreground.

HERE UDJ ASSARÜ IS SEEN IN THE DISTANCE (SEE PRECEDING PAGE)

This photograph is of very great importance, because it contains the history of this entire Troglodytic region. In the foreground we see the naked, barren pumice-stone, with spots of overlying lava, or peperine. The disintegrated atoms of pumice-stone are swiftly swept away by the rain-water to the valley below, so the upper country always remains quite barren. The process of erosion is clearly seen here. Note the presence of cones even at this elevation, for a beautiful cone stands on the very summit of the ridge at the left of Udj Assarü and five other fine ones are to be seen on the right of Udj Assarü. This means that an almost inconceivable amount of erosion has taken place here. It means that the original level of the plateau corresponded approximately with the tiptop of Udj Assarü itself, and that all the rest of the plateau has rotted off and been washed away. Accordingly, the cone formations are not of comparatively recent date, as some have contended from the fact that no ancient writer mentions the cones. On the contrary, this plateau was in existence in most remote antiquity.

THIS PHOTOGRAPH, TAKEN FROM THE UDJ ASSARÜ (SEE PAGES 286-287), GIVES A GENERAL VIEW OF A SERIES OF EROSION CANYONS, SUCH AS ARE SHOWN ON PAGES 290, 296, AND 316

In the far distance, or on the horizon, the original level of the pumice bed is to be seen. The cones are so numerous that they seem like mere striations. The immediate foreground of the picture lies just below the original level of the plateau, and it shows the work of erosion. Nearly 50,000 cones are in the area covered by this photograph. In the right foreground appears a cone, while hundreds may be discerned in the background (see text, page 325).

MANY OF THE CONES WERE NEVER EXCAVATED INTO DWELLINGS; IT IS NOT EASY TO UNDERSTAND JUST WHY SO FINE A SPECIMEN AS THE ONE IN THE FOREGROUND HERE SHOULD NOT HAVE BEEN UTILIZED

The middle distance is occupied by a modern Troglodyte village, and the lofty Udj Assarü (see pages 286-287) is seen in the background. Stratification makes the immense caps possible. Note that the cap of the cone near the center of the picture occupies about three-fourths of the entire height of the cone.

IN THE COURSE OF THE CENTURIES THE STREAMS OF WATER WHICH WERE ABLE TO FORCE THEMSELVES UP, EVEN THROUGH THE THICK BED OF LAVA, HAVE HOLLOWED OUT CANYONS OF GREAT DEPTH AND WIDTH: A SCENE NEAR UDJ ASSARÜ

Such a canyon is seen here; one also sees that the mass of pumice was not worn away evenly and equally at all spots by the solvent action of the flowing water. In places the stone offered a sturdier resistance to the abrasive influences, and the result was the formation of tens of thousands of cones, some of which are free-standing, while others are closely engaged with each other. In this picture we see one side of a valley formed by erosion. On the left the rim of the bluff gives approximately the original level of the pumice-field. In the center is a small, but perfect cone. In the middle distance there is stratification, which runs through cones and obelisks that are now entirely free-standing; where stratification appears, the cones are more in the shape of obelisks, such as are illustrated on page 295.

EVEN THE UPLANDS, WHOSE SOIL CONSISTS WHOLLY OF DISINTEGRATED AND ASHLIKE PUMICE-STONE, PRODUCE NOT ONLY GRAPES AND FRUIT (AS CAN BE SEEN IN THE MIDDLE DISTANCE), BUT BEANS, MELONS, CUCUMBERS, ETC.

One sees small fields in the lowlands in this picture and dwellings in the cliffs.

HERE NOTICE THE LAYER OF LAVA SUPERIMPOSED UPON THE GREAT BED OF PUMICE-STONE

On the right we see cones in the incipient stage—that is, in the actual process of formation—and looking for all the world as if they were half buried in snow. From the left of the picture one gets an idea of how closely the cones stand together. In places it is very difficult to thread one's way through them.

of a man, there can be, strictly speaking, no such thing as a united State.

HOW PRIMITIVE MAN VIEWED HIS FELLOW-BEINGS

In the world in which primitive man lived, every man was the uncompromising foe of every other man; the man who lived in one den could have nothing in common with the man who lived in the neighboring den. A pale, or dead-line, was drawn between each several den, and the owner of den A was an outlaw if he crossed that dead-line into the territory of the owner of den B.

There were no rights of intermarriage; the den-owner's woman was the captive of his spear; she was the slave of her captor. She bore him children, but the children and the mother alike remained the slaves of the lord of the den, who allowed them to share the abode with him. He fought for them with all the savage tenacity of the bulldog, the lion, or the tiger; and while he lived no other human being might enter that den and live to tell the tale.

TROGLODYTE TYPES OF ASIA MINOR

Several kinds of Troglodytes are still to be seen in various parts of Asia Minor. The most primitive type known to me is to be found in Cilicia Tracheia. They may be seen in many places, but they were thrust more particularly upon my attention in a pass in the Taurus Mountains some ten miles north of Ermenek (Germanicopolis).

The inhabitants of this valley, known as Bakluzan Dere, are cliff-dwellers of the secondary type—that is, they have done considerable work in the way of improving their abodes, whose entrances

HERE THE CAPS OF THE OBELISKS ASSUME GREAT PROPORTIONS AND THEY ARE EQUAL TO ONE-HALF OF THE ENTIRE HEIGHT OF THE OBELISKS

have been walled in with fences of stout masonry.

They have sought and found for themselves complete isolation. They seem to have none of the instincts of agricultural man and they are wholly inhospitable.

The entrances to their dwellings are high up in the almost perpendicular walls of the cliffs, and they are reached solely by means of long poles, which are light enough to be drawn up when the lord of the den and his family are safely housed. And when housed they really are safe from intrusion, for it would require a host to force an entrance against the will of the family. (For methods of ingress by other types of Troglodytes, see illustration on page 285.)

This very method of reaching the entrance by means of a pole makes it imperative for all the members of the several families of these cliff-dwelling Troglodytes to be strong and vigorous persons, for the sick, the aged, and the infirm can neither enter nor leave the dwelling, nor can they be brought in nor taken out by others, unless they be strapped to the back of a man, who would need to be not only strong, but very active as well.

A PRACTICE OF KILLING THE AGED AND INFIRM

One ancient writer tells us that some Troglodytes made a practice of killing all those who were not in first-rate physical condition, on the ground that a man who cannot earn his own living has no right to live; and when one sees these dwellings, one can imagine still another reason for killing off the aged and the infirm—

THE CONES DIMINISH IN HEIGHT AS THE RIM-ROCK OF THE BLUFF IS REACHED, FOR THERE THE CONES APPEAR IN THE PROCESS OF FORMATION

Notice here the lava caps on the cones. Originally every cone had a cap of lava, and indeed the protecting stratum of lava was the primary cause of the wearing away of the pumice-stone into the shape of cones.

because of their inability to get in or out of the house.

The cliffs of the Bakluzan Dere are thickly studded with dwellings that give evidence of being inhabited by a large number of people, but I did not get a glimpse of any of them, nor was a single doorway open, though some of the entrance poles had not been pulled up.

Troglodytes, or semi-Troglodytes, of a ruder, but less inhospitable, type may be seen in many places in Lycaonia.

At Serai, north of Karaman, a stratum of rock lies upon a bed of clay, which, of course, may be excavated *ad infinitum* without very great labor, and the formation is made, as it were, for the Troglodytes. But the people who inhabit these abodes are not true Troglodytes, since they use them only during the long summer season.

The life there is most crude, and the cavities in the ground show no signs of having been improved by man. It is cer-

OFTEN THE CONES ARE NEARLY PERFECT IN SHAPE, BUT IN PLACES WHERE STRATIFICATION DISTURBED AND RESISTED THE EROSIVE PROCESSES THEY ARE SLENDER AND ASSUME THE GENERAL OUTLINES OF THE COLUMN OR OBELISK

But the obelisks have cone or sugar-loaf caps, or at all events they did have them originally. Here the caps are very large. The picture shows a stratified formation, which runs horizontally through all the obelisks; consequently in past ages, before erosion set in, all of these obelisks were united in one solid mass of pumice-stone. Here the huge caps are of harder material than that of which the underlying mass consists.

tain that the primitive Troglodytes lived in just such dwellings; but for all that, these people are not primitive at heart, for they have made no attempt to secure isolation. The element of fear of mankind is not present—that is, no kind of dead-line has been drawn against hostile neighbors.

THIS IS A DISTANT VIEW, BUT STILL IT SHOWS EXAMPLES OF CONES WITH DOORS OR HOLES OF INGRESS HIGH ABOVE THE GROUND

There are no visible finger-and-toe holes, as on page 285. They have merely rotted away in the course of the ages. The picture is otherwise interesting, as it shows us garden and desert lying side by side. The garden is easy to see, while the desert lies in the very foreground, where the bare pumice-stone is not disintegrated as yet.

A FEW OF THE 50,000 CONES NEAR UDJ ASSARÜ

The overlying stratum of lava, being harder than the pumice-stone, offered a longer resistance to the abrasive influences, and the result was the caps that appear on so many of the cones. One good specimen appears in this picture; they are seen frequently in other pictures.

The Greeks have left us accounts of engrossing interest concerning the Troglodytes of antiquity.

HOW THE TROGLODYTES LIVED 2,000 YEARS AGO

The Greek geographer and historian, Agatharchides, who flourished about 175 B. C., wrote a book on the region about the Red Sea. It was intended as a geography for his royal pupil, the heir to the throne of Egypt, who would find it to his interest to know as much as possible about his territories on the Red Sea and about the strange people who lived there. This book has perished, but about fifty pages of it were quoted by other writers whose works have survived to our times, and among other things they have preserved Agatharchides's account of the Troglodytes of the region of the Red Sea.

Here is the account as quoted by Diodorus Siculus:

"The races that live in the extreme south have the form of men, it is true, but they lead the life of animals. These are the Ethiopians and the Troglodytes.

"The Troglodytes are called nomads by the Greeks. But though they do lead a nomadic life and gain their daily food from their flocks, nevertheless they have organized governments, at the head of which stand sheikhs who are clad with absolute power.

"They have their women and children in common, with the sole exception of the one woman who belongs to the sheikh. Should another man approach this woman, the sheikh exacts from him a fine consisting of a fixed number of sheep.

"THEIR FOOD A MIXTURE OF BLOOD AND MILK"

"When the great rains come upon them, at the time of the annual recurrence of the periodic monsoons, the Troglodytes

THE TALLEST CONES USUALLY STAND IN THE NEIGHBORHOOD OF THE CENTER OF THE ERODED VALLEYS, AS HERE

This tall cone is still inhabited and has about eight stories. Evidence of thrift is seen in the fruit spread out to dry in the sun on the floor of what was once an interior apartment. In the course of time its exterior wall has rotted away, leaving a great hole in the otherwise beautiful cone. The upper stories are given over to the pigeons, as may be seen from the windows that are now walled in. This is true of its neighboring cone also.

IF WE ENTER THE DOORWAY OF ANY OF THESE CONE-DWELLINGS, WE FIND OURSELVES IN A SPACIOUS CHAMBER, ABOUT WHOSE SIDES NICHES AND SHELVES FOR THE STORAGE OF HOUSEHOLD GOODS HAVE BEEN CUT INTO THE STONE

But something not in the original plans of the architect has happened in the case of this apartment; for in reality it consists of two chambers, one above the other. The floor of the upper chamber has broken away, owing to the fact that it was left too thin to support the weight demanded of it. Its outline may be traced easily. The stairways to the upper stories are like wells or chimneys. They had no stairs, as we understand stairs, and one mounted to an upper story by means of finger-and-toe holes precisely like those which gave access to the front entrance. Some of these cones have as many as nine stories, but most of them have only two, three, or four stories. One can easily count the stories from the outside by means of the windows.

live upon a mixture of blood and milk, which they first boil separately for a time and then stir in together. After these annual rains, when the pasture grounds have become parched by the excessive heat, they migrate to the marshy places, where they fight with each other for the possession of the pasture grounds.

"They use for food only the old animals and those that begin to grow sickly. It is for this reason that they do not apply the name of parent to human beings, but to bulls and cows, to rams and sheep. These they call their fathers and their mothers, because these animals, and not the persons who begat and bore them, furnish them with their daily food.

"Private individuals use as a beverage a decoction made from the thornbush, but from some flower or other they make for the sheikhs a drink that resembles the meanest kind of must known in Greece.

"They migrate with their herds from pasture to pasture, and they avoid long residence in one place. They wear a clout about their loins, but otherwise they go nude. All the Troglodytes practice circumcision, as do the Egyptians; but those among them who from a misfortune are said to be 'stunted' and have had their privy parts shorn away with a razor when they were still infants, pasture the country that lies between the Straits.

"Those of the Troglodytes who are

THE SMALLER CONES IN THE CENTER OF THE PICTURE ARE GRANARIES AND PIGEON-HOUSES

On the left of them are three engaged cones with a wedge-shaped annex which has a door near the top of the wedge. Finger-and-toe holes lead to this door. These three cones are at present a granary, from which came the barley that fed the animals in the author's caravan. It was brought out of the one hole on the backs of men, just as it had been carried in on their backs. Such a granary is comparatively free from the visitation of thieves. Notice the cap on one of the cones. Here, as in many other cases, the cap could not maintain its position on the tiptop of the cone but for the fact that it forms one integral conglomerate mass with the cone. Note the fruit drying in the apertures at the right.

IN MANY CONES THE EXTERNAL WALLS THEMSELVES HAVE ROTTED AWAY, LEAVING THE CHAMBERS EXPOSED

Such exposed chambers, if they have the proper exposure, are utilized today for drying grapes, apricots, and other fruit; for, by reason of their lofty location, they defy invasion on the part of disreputable animals in the shape of dogs, cats, chickens. Here one can see the drying fruit on the floors of three stories, near Udj Assarü.

THIS FIVE-STORY CONE-DWELLING WAS A FOUR-FAMILY FLAT

The three doorways on the ground floor and still a fourth doorway in the third story (to which access was had by means of the usual finger-and-toe holes shown on page 285) show that at least four families were sheltered by the friendly cone before its side walls disintegrated.

THIS IS A GREEK TEMPLE WITH COLUMNED PORTICO AND NO VISIBLE MEANS OF INGRESS

But the badly weathered and forlorn appearance of the cone tells us that disintegration has disfigured it greatly. Still its great cap of lava will protect it for many centuries yet to come.

THE FACADE, DOORWAY, AND VESTIBULE OF THIS CHURCH ARE STILL WELL PRESERVED

The door leading from the vestibule into the church proper may be distinguished in the dark background. The cone on the right also has a good doorway.

THERE IS NO VISIBLE MEANS OF INGRESS TO THIS TEMPLE, WITH ITS COLUMNED PORTICO AND BROKEN COLUMNS: THE VILLAGE OF MARTCHAN
(SEE ALSO PAGES 308-309)

The absence of means of ingress is only apparent; for, as the disintegration of the stone is going on all the while, the cones are necessarily growing smaller, and the original finger-and-toe holes have simply rotted away.

said to be heavy-armed wear circular shields made of raw ox-hide and carry clubs that are decorated with iron-plated knobs; but the rest of them use bows and spears.

MUCH MERRYMAKING AT TROGLODYTE FUNERALS

"Their mode of burial is very singular. They bind together the neck and the knees of the dead person with withes made from the thornbush; then they carry the corpse thus bound up to a place at some distance from the camp, where with laughter and with merriment they hurl upon it stones as large as they can hold in their hands, until they succeed in covering and concealing the body with the stones. As the final ceremony they place a goat's horn upon the heap, and then go to their several homes without the display of the slightest kindly feeling.

"They do not fight, as the Greeks do, about land or about accusations which some one has made against them, but they do fight about the various pasture grounds which from time to time succeed each other according to the season. In these fights they begin by hurling stones at each other; then, after some of them have been wounded, they betake them to their bows and arrows. Many of them are soon killed, because they are experts in the use of these weapons and they shoot accurately, and moreover the men at whom they shoot are unprotected by defensive armor.

"Eventually the old women throw themselves into the midst of the fray, and as they are held in great reverence, they soon put an end to the fights. For a custom prevails among the Troglodytes which forbids them to strike a woman under any circumstances whatsoever, and in consequence of this custom the fighting ceases as soon as the women appear upon the scene.

THE INTERIOR OF MANY OF THE CHURCHES ARE STILL COVERED WITH FRESCOES, WHICH, HOWEVER, ARE MORE OR LESS OBLITERATED

Among them we find portraits not merely of Greek saints, but traces even of pretentious paintings. In this photograph we see specimens of such mural paintings. Those who are familiar with Byzantine sacred painting will be able to detect a number of portraits of saints by means of the nimbus. The characteristic Byzantine columns and arches will also be noticed. In some cases the paintings are in very ancient style, while others are evidently more recent.

"The old men, who on account of their age are no longer able to follow the flocks, tie the tail of a bull round their necks and thus commit suicide by suffering themselves to be dragged to death. But, under the pretense of kindly solicitude, any one who wishes to do so may place a rope about the neck of the man who unduly postpones his suicide, and so by means of this pointed reminder he is forced to leave this life.

"It is also their practice to put to death cripples and those who are afflicted with an incurable disease, for they maintain that the love of life is inexcusable in the man who can do nothing to justify his continuance in life. That is the reason why all Troglodytes are sound in body and are mostly in the prime of life; for men of more than sixty years of age are not seen among them."

Strabo mentions some further details which he quotes from Artemidorus:

"The food of the Troglodytes consists

THE INTERIOR WALLS OF THE CHURCHES SHOW CHARACTERISTIC BYZANTINE ARCHITECTURE, OR RATHER THE IMITATION OF BYZANTINE ARCHITECTURE

It was by no means easy to secure photographs of these interiors.

of meat and bones; the bones are crushed and mixed with the meat, so as to form a kind of minced hash, which is wrapped in fresh, untanned hides and roasted. This minced haggis is prepared in a variety of ways by the cooks, whom they regard as unclean persons. They consume not merely the minced meat of this haggis, but the bones and the skin as well."

HERODOTUS WROTE OF "ETHIOPIANS WHO DWELL IN HOLES"

Herodotus's account of "the Ethiopians who dwell in holes" informs us that, "Of all the nations of whom any account has reached my ears they are by far the swiftest of foot. They feed on serpents, lizards, and other similar reptiles. Their language is unlike that of any other people; it sounds like the screeching of bats."

These Troglodytes have been identified with the Tibboos of Fezzan. The historian's criticism of their language was a typically Greek view to take, for the Greeks knew only their own tongue and they were conceited enough to believe that those who did not speak it simply did not speak at all, but either screeched like bats or twittered like birds.

On the other hand, Xenophon gives us a delightful picture of the Troglodytes of Armenia, who have remained so unchanged throughout the centuries that his description might be used of them at this present moment. He says:

"It was here that Polycrates, an Athenian and captain of a company, asked for leave of absence; he wished to be off on a quest of his own; and, putting himself at the head of the active men of the

GREAT NUMBERS OF THE CONE-DWELLINGS ARE NOW USED AS DOVECOTES FOR THE HOUSING OF THE FLOCKS OF PIGEONS THAT GIVE BOTH THEIR EGGS AND THEIR FLESH TO THEIR TROGLODYTE OWNERS

The windows of such hen-coop cones are always walled in, though holes of ingress and egress are left for the birds. These cones are usually painted red or white on the outside of the holes as far as the arm can reach. The reason for this practice is not apparent, unless it is that the pigeons are thus supposed to be aided in locating their abodes.

division, he ran to the village which had been allotted to Xenophon.

"He surprised within it the villagers, with their headman and seventeen young horses which were being reared as a tribute for the king, and, last of all, the headman's own daughter, a young bride, only eight days wed. Her husband had gone off to chase hares, and so he escaped being taken with the other villagers.

"The houses were underground structures, with an aperture like the mouth of a well, by which to enter, but they were broad and spacious below. The entrance for the beasts of burden was dug out, but the human occupants descended by a ladder.

"In these dwellings were to be found goats and sheep and cattle, and cocks and hens, with their various progeny. The flocks and herds were all reared under cover upon green food.

XENOPHON'S VISIT TO THE DWELLERS UNDERGROUND

"There were stores within of wheat and barley and vegetables, and wine made from barley in huge bowls; the grains of barley malt lay floating in the beverage up to the lip of the vessel, and reeds lay in them, some longer, some shorter, without joints. When you were thirsty you took one of these in your mouth and sucked. The beverage without admixture of water was very strong, and of a

DISINTEGRATION OF THE EXTERIOR WALLS IS FAR ADVANCED IN THIS ORIGINALLY SPLENDID CONE, WITH ITS CAP STILL IN POSITION

This photograph was selected by Perrot as typical of the whole series, and it appears in his History of Hittite Art.

delicious flavor to certain palates, but the taste must be acquired.

"Xenophon made the headman of the village his guest at supper and bade him keep a good heart. So far from robbing him of his children, the native was assured that the Greeks would fill his house full of good things in return for what they took before they went away; only the headman must set them an example and discover some blessing or other for the army until they found themselves with another tribe.

"To this the headman readily assented, and with the utmost cordiality showed the Greeks the cellar where the wine was buried. For this night, then, having taken up their several quarters as described, they slumbered in the midst of plenty, one and all, with the headman under watch and ward and his children with him safe in sight.

"On the following day Xenophon took the headman and set off to Cheirisophus, making a round of the villages, and at each place faring sumptuously and merry-making. There was not a single village where the inhabitants did not insist on setting a breakfast before the visitors, and on the same table were spread half

A VINEYARD GROWS ON THE ROOF OF THIS MAN'S HOUSE

The landscapes amid which the modern Cappadocian Troglodyte loves to dwell are varied to infinity and they are never tame; nay, they are always fascinating, and oftentimes even uncanny and startling. The modern Troglodytic usages add to, rather than detract from, the general weirdness of the landscape. In the foreground of this picture we see an instance of a man's vineyard lying, apparently, on the top of his house. Note also the threshing-floor in foreground. This is the village of Martchan (see pages 303 and 309), and Udj Assarü (see page 286) is seen on the horizon and many cones in the background.

THE NATIVES OF THIS REGION ARE STILL TROGLODYTES: VILLAGE OF MARTCHAN (SEE ALSO PAGES 303, 308)

But if we leave out of consideration the fact that their dwellings are at least partially underground, they differ in habits and customs in no whit from the ordinary Turkish villagers with ordinary humdrum surroundings. Frequently the front, or façade, of the house alone is constructed from blocks of the easily quarried pumice-stone, while all the rest of the abode is subterranean. This fact is well illustrated by this photograph (see also pages 314, 315). What appear to be complete houses here are really only façades. On the left one can see that the great cone (originally a Greek temple, as the gable indicates) forms one house with the builded annex.

THE USE OF THE CONES AS THE REAR AND REAL STOREHOUSE OF MODERN BUILDED FRONTS IS QUITE COMMON

On the extreme left is a fine old cone which has been utilized in that way. This cone is habitable to its very top. Note the group on the right.

THIS IS NOT A TRUNCATED CONE

The photograph was taken for the sake of the details, and the top of the cone and of the cliff lie outside the field of the camera. On the left it is easy to see that the great cone is the real habitation. We notice here the first example of an actual stairway; it is modern. On the right the rock has rotted away, leaving a great chamber exposed. Inside this chamber an enterprising modern Troglodyte has built the façade of his house, which, as one can easily see, fills only about one-half of the original chamber in which the Troglodyte of antiquity lived. Note cart wheels on right (see pages 322, 323).

a dozen dishes at least—lamb, kid, pork, veal, fowls, with various sorts of bread, some of wheat and some of barley.

DRINKING A GUEST'S HEALTH FROM THE COMMON BOWL

"When, as an act of courtesy, any one wished to drink his neighbor's health, he would drag him to the big bowl, and when there he must duck his head and take a long pull, drinking like an ox. The headman, they insisted everywhere, must accept as a present whatever he liked to have. But he would accept nothing, except where he espied any of his relations, when he made a point of taking them off, him or her, with himself.

"When they reached Cheirisophus there was a similar scene. There, too, the men were feasting in their quarters, garlanded with wisps of hay and dry grass, and Armenian boys were playing the part of waiters in barbaric costumes, only the feasters had to indicate by gesture to the boys what they were to do, as if they were deaf and dumb.

"After the first formalities, when Cheirisophus and Xenophon had greeted one another like bosom friends, they interrogated the headman in common by means of the Persian-speaking interpreter.

" 'What was the country?' they asked. He replied, 'Armenia.' And again, 'For whom are the horses being bred?' 'They are tribute for the king,' he replied. 'And the neighboring country?' 'Is the land of the Chalybes,' he said, and he described the road which led to it.

"So for the present Xenophon went off, taking the headman back with him to his household and friends.

"The horses in this country are smaller than the Persian horses, but are more

THIS PHOTOGRAPH GIVES A GENERAL VIEW OF THE VILLAGE OF URGÜB, FROM WHICH THE TWO PANORAMIC STREET SCENES ON PAGES 314 AND 315 WERE TAKEN

The village is built around one of those great pumice boulders, or hummocks, of which several specimens are shown on pages 324-327. Most, if not all, of the houses seen here are mere façades giving entrance to the chambers, which extend horizontally into the bowels of the earth. The house façades are all built of quarried pumice-stone. The top of the hummock on which the domed mosque stands marks the original level of the plateau.

THIS IS ANOTHER TYPICAL VILLAGE SCENE IN MODERN TROGLOVILLE

The mass, or hummock, of pumice-stone has been utilized from top to bottom by the natives in their own peculiar way. These great hummocks thus utilized in Trogloville have advantages over the cone dwellings, which are conditioned by their shape; whereas here the dwelling may be enlarged in size at the pleasure of the householder. Note the cone on the right.

OFTEN A MODERN DWELLING IS EXCAVATED, NOT IN A CONE, BUT IN THE FACE OF THE BLUFF OR CLIFF

When this is the case the front, or façade, room, which opens upon the street, is the only room with light. The other rooms are enveloped in midnight darkness the year round. The owner of such an abode can extend his dwelling indefinitely into the earth and no one need know aught of his enlarged residence. The interior chambers are used chiefly as granaries and for storing away any and everything belonging to the household economy of a rude, agricultural, and semi-pastoral people. Even their chaff, which is made to take the place of our hay, is kept in these underground and densely dark chambers. What is stored there is safe from rain as well as from thieves. In this picture the scene is typical of the village of Urgüb (see also page 312). In the foreground are quarried blocks of pumice-stone intended for building purposes. The two-storied structure on the right will be seen in the next picture.

THIS PHOTOGRAPH WAS TAKEN FROM THE UPPER CHAMBER OF THE AUTHOR'S LODGING-PLACE AT URGÜB (SEE PAGES 312 AND 314)

To the uninitiated person there is not the slightest indication that we are in the presence of Troglodytic dwellings, and the reader will have to take the author's word for it. The group on the right is making life miserable for the present writer, who was at the moment examining something antique. This illustrates what happens to the traveling archæologist at every turn.

SKETCH MAP SHOWING LOCATION OF MT. ARGÆUS AND OF THE TROGLODYTES (SEE PAGES 283 AND 318)

THE CLAIM HAS BEEN MADE THAT THIS VERY REGION IS THE ORIGINAL HOME OF THE APRICOT

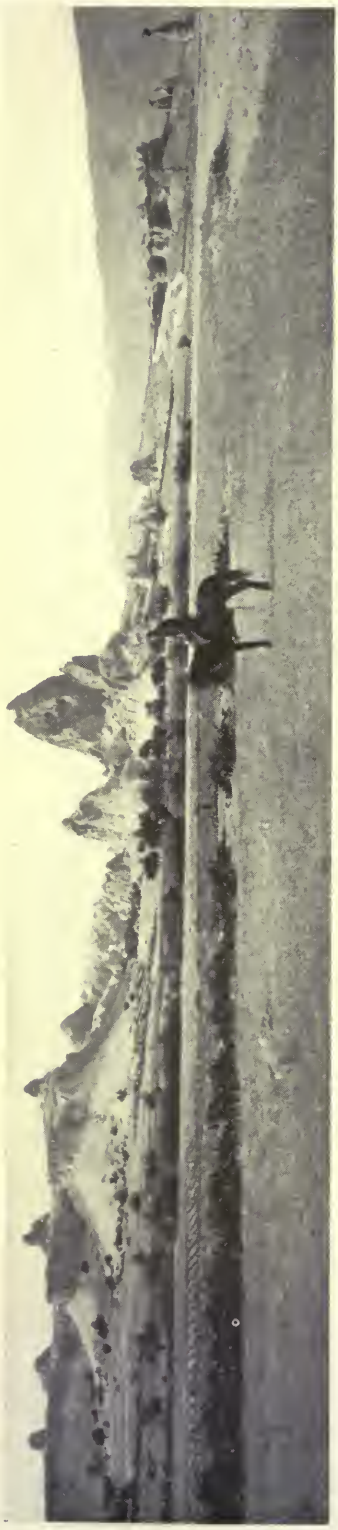
The soil in the valleys, as seen here in the foreground, is fertile and produces grapes, vegetables, and fruit, chiefly apricots, of very fine quality.

THE ELABORATE DOORWAY PROCLAIMS THAT THIS HUGE ROCK MASS, WITH ITS HUNDREDS OF CHAMBERS, WAS A PALATIAL RESIDENCE IN OLDEN TIMES, BUT NOW IT IS GIVEN OVER TO PIGEONS

The holes of ingress and egress for the pigeons are seen in the background of the two great openings in the wall.

IN THESE MASSES THE PROCESS OF DISINTEGRATION WAS RETARDED BY THE SUPERINCUMBENT LAYER OF LAVA

This was evidently a fashionable street in Trogloville, if we may judge by the numerous rectilinear, and therefore decorative, window openings. They are too small to be exposed chambers that were once inside the cliffs.



HERE WE HAVE A VIEW OF THE EXTREME EDGE OF THE CONE FORMATION, AT THE POINT WHERE THE CANYON RUNS OUT INTO THE PLAIN

The soil, even of the level ground seen here, is still disintegrated pumice-stone and very fertile. On the extreme right of the picture we see a tiny cone with its large cap. It is almost perfect and it is the smallest cone the author saw.

spirited. The headman explained to the Greeks how they should wrap small bags or sacks around the feet of the horses and other cattle when marching through the snow, for without such precautions the creatures sank up to their bellies."

A BIBLICAL REFERENCE TO WEALTHY TROGLODYTES

Often the cave-dwellers attained to great wealth and even to political importance. The prophet Obadiah (1:3) certainly had such Troglodytes in mind when he speaks of the pride and the arrogance of the Edomites, of their feeling of confident security because of the fact that they dwelt in the lofty clefts of the hills, beyond the reach of their enemy.

Mt. Argæus (see text, page 283), now an extinct volcano, though it was still smouldering in the time of Strabo, is situated almost in the center of the peninsula of Asia Minor (see map, page 315). The material ejected by this volcano during the many ages when it was active covers an immense area and consists of a vast bed of pumice-stone or tufa of unknown depth, on top of which there flowed a sheet of lava which varies in depth from four to ten or twenty feet (see pages 322, 327, 329).

The territory thus affected by the eruptions of Mt. Argæus extends from the southwest to the northwest of the mountain for a distance of between thirty and forty miles, covering the entire region between Injesu, Martchan, Urgüb, Udj Assarü, Nev Shehir, and Tatlar on the west and extending to Soghanlü Dere (valley) on the south, while on the north and northwest it extends far to the north of the Kizil Irmak (Halys), which has been flowing across the bed of pumice-stone from remote geological times.

The pumice-stone is soft. It is reported that one man excavated a chamber 25 feet long, 13 feet broad, and 10 feet high within the space of 30 days.

FIRST EUROPEAN TRAVELER AMONG TROGLODYTES CONSIDERED A GULLIVER

Paul Lukas, who traveled in Asia Minor at the behest of Louis XIV, was the first European to visit this region, but his visit was very hurried, and, strange as it may seem, he thought that these cones

THIS PHOTOGRAPH RECALLS VERY FORCIBLY THE WORDS OF THE PROPHET OBADIAH, WHO, IN SPEAKING OF THE EDOMITES OF THE REGION OF PETRA, SAYS:

"The pride of thy heart hath deceived thee, O thou that dwellest in the clefts of the rock, whose habitation is high; that saith in his heart, Who shall bring me down to the ground? Though thou mount on high as the eagle, and though thy nest be set among the stars, I will bring thee down from thence, saith Jehovah." But the inhabitants of "the Mount of Esau" were of a much later date and much more refined Troglodytes than those with whom we are dealing now. The summit of this pillar of the sky (near Urgüb) represents approximately, but only approximately, the original level of the whole surrounding country. And if that be so, then an amazing amount of erosion and disintegration has taken place. A modern village cemetery is in the foreground. Note the human figures.

were builded by man, and the stories he told about the wonders he saw were not believed by any one.

For instance, the German poet Wieland gives utterance to the following reflections in regard to Lukas and this cone-country:

"Traveled persons are inclined to tell extravagant stories, and to exaggerate what they have seen, and I cannot affirm

AS ONE JOURNEYS WESTWARD FROM UDJ ASSARÜ AFTER PASSING NEV SHEHIR, ONE REACHES A VAST LAVA FIELD THAT OVERLIES THE PUMICE-STONE; IT IS STILL VERY ROUGH AND UTTERLY BARREN

The village of Tatlar lies in a valley formed by erosion in this lava field. The valley head is seen in the background of this picture. The cone formation is not a prominent feature of the Tatlar landscape, but the activity of the Troglodytes is everywhere visible in the bluff on the left. Note sledding wheat on the left.

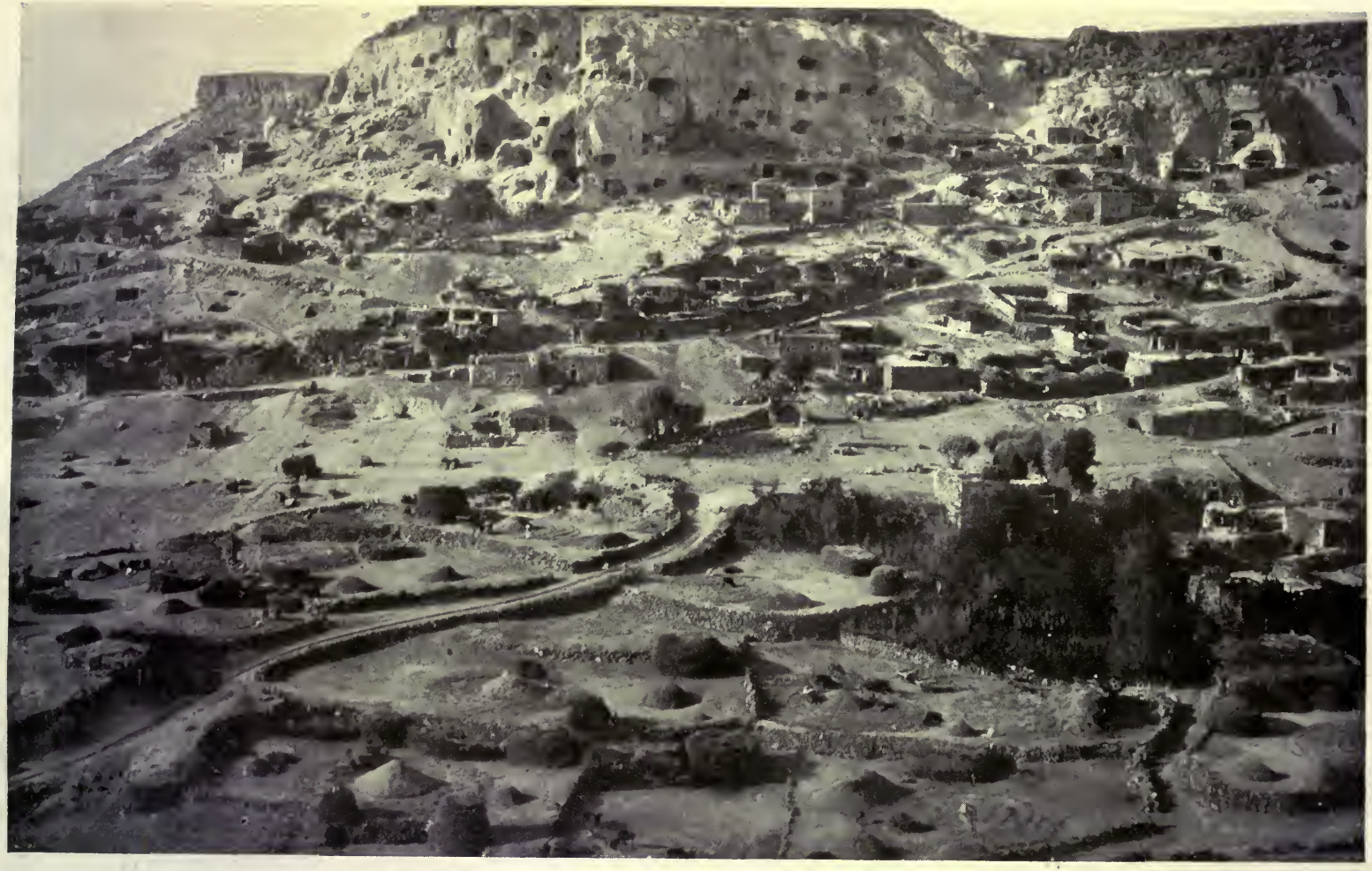
OCCASIONALLY A GREAT BOULDER BREAKS AWAY FROM THE BLUFF AND THUNDERS DOWN UPON THE WRETCHED VILLAGE, LEAVING DEATH AND DESTRUCTION IN ITS WAKE

Only four days before the author's visit such a boulder had precipitated itself upon the village, burying twelve houses and killing five men (the women who were killed were probably not counted). Several rocks were threatening to fall. The poor people appealed to the visitor as to one who must needs have superior knowledge: "Does danger threaten our house?" "Will that rock fall?" The largest piece of the devastating rock is seen in the foreground. Its course can be traced, and the chambers exposed when it broke away are plainly visible. The course of the rock may be discerned also in the preceding picture.

that Paul Lukas is wholly free from this universal weakness. To give only a few instances from his book of travels, I ask if there can be found a man who will not consider Lukas's story about the innumerable host of pyramids exaggerated? He affirms that each one of these pyramids is hewn from a single stone (page 283), and that they are hollowed out in such wise that they have fine doors for entrances (page 317), that they have several apartments rising one above the other (page 282) and connected with each other by means of interior stairways, and that these apartments are lighted by large windows (page 324).

"Many of these remarkable buildings," continues Wieland with true Prussian superiority and cocksureness, "according to our traveler, have never been excavated into dwellings (page 289), though the excavation of many of them had been begun, but was left in an unfinished state.

"He asserts that on the one side of the bluff by which his caravan passed there were no fewer than 20,000 such build-



THE DWELLINGS OF TATLAR ARE EXCAVATED IN THE FACE OF THE BLUFF, WHICH IS OF TWO LAYERS, AS USUAL

Both strata are clearly seen here; first the overlying stratum of lava and beneath that the deep bed of white pumice-stone, in which the dwellings are excavated. The excavated chambers at Tatlar are almost interminable and they inspire the present natives with awe. It is said that it is dangerous to wander far into the interior of the earth here, and the natives are not willing to act as guides. The threshing-floors in the foreground are most interesting.

DISTANT VIEW OF THE CLIFF-DWELLINGS AT TATLAR; ON THE THRESHING-FLOORS AT LEAST 12 YOKE OF OXEN MAY BE DISTINGUISHED

IN THE LEFT HALF OF THIS PICTURE A HOST OF WINDOW-OPENINGS ARE VISIBLE, BUT NOT A SINGLE DOORWAY, AND THE ENTRANCE TO ALL THIS AMAZING MULTITUDE OF CHAMBERS IS FAR AWAY TO THE RIGHT

Nothing could better illustrate the immensity and far-spreading nature of these subterranean chambers, which were rendered more difficult of access and less liable to invasion by reason of the infrequency of means of ingress (see next page).

THIS IS A PICTURE OF SOGHANLÜ DERE (ONION VALLEY), WHICH LIES A FULL DAY'S JOURNEY SOUTH OF THE UDJ ASSARÜ (SEE PAGES 286, 287) AND URGÜB REGION (SEE PAGES 312, 314)

It is a canyon branching from the larger canyon of Ortakieui (Middle Village). (See pages 328, 329). Its cliffs are mere shells and they contain thousands on thousands of chambers, churches, chapels, and graves. Cones, though they do occur even here, are rare, but there are no temple or church façades, as at Martchan (see pages 303, 308). In this picture one sees five entrances, while all the numerous other openings are windows. Story rises upon story. Thousands of pigeons now have their homes in these dusky chambers in the rocks, for at this place they are no longer inhabited by man. Notice the windows painted on the outside. The author can give no explanation of the painting. In the numerous chapels pictures of Greek saints may still be seen on the walls; many of the saints represented in the pictures are named in Greek. In the floors of the chapels graves are cut, and in some of them we found human skeletons quite exposed. Indeed, graves are frequently found in the dwellings themselves, and so it seems clear that the people lived in the same rooms with their pigeons and their dead.

ings, and that he had been told that on the other side of the valley a still greater number were to be seen.

"Can anything be more incredible than that there can exist such a vast host of pyramids excavated into ordinary dwelling-houses? For they certainly did not spring from the earth like mushrooms. Moreover, not a single word about them is to be found in any ancient author nor in the narrative of any other traveler. We might understand this silence if Lukas had discovered the pyramids in the great Syrian Desert, but in a land as well known as Cappadocia—!

"However, since Paul Lukas affirms that he saw them with his own eyes, they must be there. But we shall have to strike out at least one nought from the number, which, according to his estimate, is more than 50,000. Five thousand such pyramids is still a very respectable number, and in view of the hasty and superficial way in which Lukas saw them (for his caravan did not stop, nor was he permitted to leave it), he should have distrusted a calculation made by his eyes alone."

THEIR ANCIENT STORY WAITS UPON ARCHÆOLOGISTS AND EXCAVATORS

And yet Lukas was right, except in supposing that the cones were constructed by man, if indeed he did actually entertain

HERE THE FACE OF THE ROCK HAS BEEN BROKEN AWAY BY EARTHQUAKES, SO THAT A NUMBER OF CHAMBERS ONCE IN THE INTERIOR OF THE CLIFF NOW STAND EXPOSED

The holes in the walls of the exposed chambers were intended to serve as shelves. In a number of places one may see the thickness of what we may call the floors; or, in other words, the thickness of the stone left between two superimposed rooms. It seems very thin here, and often it was too thin to bear the weight it was expected to bear. Behind the fragmentary rooms seen here there are countless others, invisible because hidden in the earth (see also next page).

THE GREAT HEIGHT OF THE CLIFF WILL APPEAR FROM A COMPARISON WITH THE MODERN HOUSES AT ITS BASE

The interior of this cliff is one vast network of excavated chambers, so numerous and intricate that the natives do not venture in them for fear of getting lost. The stratum of lava which is spread out over the whole region, while shown of considerable depth in this picture, is thin, as compared with the tremendous depth of the pumice-stone. The lava bed is seen at the top of this picture. Beneath it is the pumice bed. The vastness of this volcanic material indicates the ancient violence of Mt. Argæus (see page 283). The cone formation is seen here in its incipient stages, and to the left of the picture is seen a cylindrical column.

THIS IS A VIEW OF THE VALLEY ABOVE ORTAKIEUI

All of these valleys are breaks in the surrounding plateau, whose general level is given by the rim of the bluffs. The original creative cause of all the valleys like this is a small stream of water. The width of this valley at its head (see next page), just hidden from view here, is about three hundred yards; but its width increases steadily, until the maximum of one thousand yards is reached at the point below here where the author had to bid it farewell. The surrounding plateau is waterless, and therefore a semi-desert waste during the hot season of the year; but the soil in the little valley is very fertile, delighting the eye with its luxuriant gardens.

THE LARGE VILLAGE OF ORTAKIEUI, WHICH IS ONE OF THE FEW VILLAGES IN THE INTERIOR OF ASIA MINOR IN WHICH GREEK IS STILL SPOKEN; THERE ARE OTHERS IN THIS SAME REGION—GELVERE, MALAGOB, NIGDE

Christianity was always strong in this region, which produced Saint Gregory and the Basils. Indeed, Gregory was himself a Troglodyte, and his very farm can be located. Numerous rock-cut dwellings are visible in the bluff behind Ortakieui.

THE ENTRANCE TO THE VALLEY OF ORTAKIEUI (SEE PAGE 328) FROM THE PLATEAU IS ARTIFICIAL, CONSISTING OF A ROADWAY EXCAVATED THROUGH THE RIM-ROCK OF THE BLUFF

The roadway descends sharply. No doubt this roadway has grown in depth as the valley itself grew in depth, for its beginning goes back to at least 2,000 years before Christ. It is now much worn, and animals find difficulty in getting down the slick and naked stone.

such a belief, for I have never been able to consult a copy of his book and I rely on Wieland for my information. It is true that I have not seen the entire field covered by this formation, but I worked faithfully inspecting and photographing the cones, and I find no difficulty in agreeing with Lukas that there are more than 50,000 cones.

The cones of Cappadocia were characteristic features of the country in the third millennium before Christ. History and archæology cannot trace them further, because, as yet, nothing is known about periods in Asia Minor more remote than that; but the spade and the archæologist may soon reveal that history to a waiting world.

THE MURMAN COAST

Arctic Gateway for American and Allied Expeditionary Forces in Northern European Russia

THE relatives and friends of American troops comprising, with French and British units, an expeditionary force operating along the Archangel-Vologda Railway line in northern Russia, have an especial interest at this time in the Murman Coast, which has been the gateway through which have passed all the munitions and supplies of food and clothing for this army during the winter months, when Archangel itself has been closed to the shipping world by a barrier of ice.

Murmansk, the chief port of the Murman Coast, is more than 300 miles nearer the North Pole than is Archangel, but, thanks to the warm waters of the Gulf Stream, which temper the winds blowing over it, the Kola Inlet, on which this army entrepôt is situated, is open to navigation twelve months in the year.

Until the closing of her Baltic ports by German blockade and the sealing of her channel of egress to the south through the Dardanelles by the alliance of Turkey with the Teutonic Powers, imperial Russia had paid small heed to the greatest asset of her Arctic shores—the Kola Inlet, an arm of the sea penetrating deep into the Murman Coast. It is true that a naval base had been established in Catherine Harbor, Kola Inlet, 20 years ago; but its port of Alexandrovsk, which is 20 miles north of the new port of Murmansk, had lain neglected and the Slavs continued to depend entirely upon Archangel as a commercial gateway for this part of their vast domain.

The port of Archangel, under the most favorable circumstances, is closed by ice to sailing vessels for six months in the year, to smaller steam craft for four months out of the twelve, and to the largest types of ice-breaking ships for at least two of the winter months.

This interruption to commerce, owing to ice floes in the Gorlo, the neck of the White Sea bottle, was of small consequence to the Slavs in the easy-going pre-1914 days; but after the tragic rout of the Tsar's forces at the battle of Tannenberg, in the Mazurian Lakes region, and the subsequent debacle on the Dunajec, Russia and her Allies knew that her continuance in the struggle against the Prussians would depend upon an ever-increasing flow of supplies and munitions to the inadequately equipped armies of Brusiloff, Alexieff, and the Grand Duke Nicholas.

It became evident that any "time out" for the ice blockade of Archangel was unthinkable, and in this emergency the Murman Coast and its ice-free port was to come into its own. Until that time the region was almost as little known to the Russian people as to the rest of the world.

THE MURMAN NOW AIDS AMERICA

Having served Russia when that country was an ally of the Entente nations, the Murman region today is the short link in the chain which connects the forces of the Allies and America with their bases of supply overseas. The

A. H. Bumstead, Cartographer

A MAP OF THE MURMAN COAST AND THE TERRITORY THROUGH WHICH RUNS THE NEW MURMAN RAILWAY

The Murman Railway was the artery which supplied with food, clothing, and munitions the American and Allied forces in Northern Russia during the winter months.

journey from the United States to Petrograd is 5,000 miles shorter by way of Halifax and the Murman ice-free port of Murmansk than by way of Seattle to Vladivostok and thence westward on the Trans-Siberian Railway.

All during the past winter months 5,000 American troops, coöperating with 12,000 British, 2,700 French, 1,500 Siberians, and 1,400 Italians, received a constant flow of supplies of food, clothing, and munitions through Murmansk, which did not come into existence until 1916.

Murmansk is the northern terminus of the Murman Railway, a single-track line which connects the ice-free port with Petrograd by way of Kandalaksha, Kem, Petrozavodsk, and Zvanda, 660 of the 900 miles of the line having been constructed since 1914 in the face of some of the greatest obstacles ever encountered in civil engineering.

War work on the Murman Railway

THE SEA NEVER FREEZES ON THE MURMAN COAST

The beneficent Gulf Stream, which saves England from a climate similar to that of Labrador, also rescues the Murman from six months of ice-bound waters, such as block the harbors of the White Sea.

Photographs by Nathalie Loubovitsky

MOST OF THE FISHERMEN OF THE MURMAN COAST ARE ONLY TEMPORARY RESIDENTS

The Pomoros, who dwell in the region west of the White Sea, travel northward to the Arctic shores in the summer and live in cantonments, or small, closely huddled villages. They are descendants of the Novgorod Russians, in whose annals there is mention of the village of Kola as early as the middle of the thirteenth century.

A LIGHTHOUSE TO THE EAST OF ALEXANDROVSK

In addition to such beacons to guide the mariner, stations have been established on the Murman Coast for the study of meteorological conditions in order that fishermen may be warned of stormy weather. Life-saving boats put to sea when storm signals fly.

Photographs by Nathalie Loubovitsky.

FISHING BOATS IN A QUIET HARBOR ON THE MURMAN COAST

Murmansk, Russia's only ice-free port in the north, is situated on the eastern shore of the Kola Inlet, 30 miles south of the Arctic coast. The inlet is a mile and a half wide at this point and there is a depth of 32 feet at the piers, while it is 70 feet deep a few hundred yards from shore. The inlet has no currents and large ships may be shifted from one side of the pier to the other without the aid of tugs. There is an eleven-foot tide.

THE RAPIDS OF THE PASVIK RIVER EIGHT MILES FROM ITS INFLUX INTO VARANGER FJORD

Boris Glob, the most westerly Russian settlement of the Murman Coast, is situated on the banks of this river (see page 338).

Photographs by Nathalie Loubovitsky

TYPE OF CANOE USED BY MURMAN FISHERMEN

Until the war-time necessity arose for an open harbor twelve months in the year, even the Russians knew little about the Murman country, but with the outbreak of the European conflict Kola Inlet became of vital importance to the whole Slavic empire.

A SINGLE HABITATION IN THE MIDST OF MILES OF DESOLATION

Most of the houses of the Murman region are one-story structures, built of unhewn logs. The crevices are packed with native moss. In the western end of the Murman, forests of birch, pine, and spruce are to be found within 20 or 25 miles of the Arctic shore, but farther east, where the influence of the Gulf Stream wanes, the timber line is 60 to 70 miles inland.

Photographs by Nathalie Loubovitsky

SUMMER HOMES OF MURMAN FISHERMEN

Whaling was a profitable industry on this coast more than forty years ago, but these animals have now entirely disappeared. Cod, herring, and salmon are the principal food fish.

A ZIRINIAN AND HIS FLEET-FOOTED FOUR-IN-HAND

During the nineteenth century a few Zirinians (also called Syrenians), a nomadic people residing on the west side of the Urals, migrated to Lapland in an effort to outrun a disease which was destroying their herds of reindeer. The animals which they brought with them were of a splendid stock. The Zirinians are skillful in handicraft and are excellent hunters.

Photographs by Nathalie Loubovitsky

PECHENGA MONKS AT WORK ON TIMBERS FOR A HIGHWAY BRIDGE

Wood is an extremely valuable commodity along the Arctic coast, but there are vast forests of birch and pine in the interior. Under the imperial régime the forests were strictly regulated by the administration of Archangel.

WHERE RUSSIA AND NORWAY MEET: THE WESTERN EXTREMITY OF THE MURMAN COAST

At the mouth of the Pasvik River the two houses, the church, and the Lapp huts in the left foreground comprise the most westerly Russian settlement on the Murman Coast. The town is known as Boris Glob and is located on one square mile of Russian ground in Norwegian territory, this part of the coast having been given to Norway, with the exception of Boris Glob, in the treaty of 1825.

Photographs by Nathalie Loubovitsky

AT THE OTHER END OF THE MURMAN: ON THE SHORES OF THE WHITE SEA

A Russian town which is inhabited almost exclusively by trading people and fishermen. In the summer-time it is practically deserted, as the fisher-folk journey westward to the various settlements on the Murman Coast. This photograph was taken at midnight in June.

LOW TIDE AT MIDNIGHT IN JUNE: EASTERN MURMAN

Photographs by Nathalie Loubovitsky

HIGH TIDE IN THE SAME FISHING VILLAGE HARBOR SHOWN ABOVE

While the hauls of fish during the spring and summer on the Murman Coast are extraordinarily heavy, much of the catch is wasted, owing to improper methods of cleaning, drying, and salting. For this reason a large part of Russia's sea food is imported from Norway. Many fishermen in the early spring sail to Tromsö and Hammerfest, Norway, with their schooners loaded with flour, which they exchange for Norwegian fish, while much of their own bountiful catch is permitted to spoil.

ON THE BLEAK TUNDRAS OF ARCTIC RUSSIA

Many years ago the Russian Government made a brave effort to colonize this part of its vast domain, but the attempt proved abortive. The colonists cut away even the sparse woods which the region supported and introduced vodka among the native Lapps. The result was mutually tragic.

Photographs by Nathalie Loubovitsky

CODFISH HUNG OUT TO DRY AT A POPULOUS FISHING SETTLEMENT ON THE MURMAN COAST

These villages, where only men are to be found, present a curious aspect in summer. The fisher-folk come and go, busy night and day repairing their tackle and cleaning their catch. It is a land of the midnight sun, but no tourists ever find their way to it.

AFTERNOON TEA IN ONE OF THE ARCTIC OUTPOSTS OF CIVILIZATION

These are men of Pechenga, a settlement situated on the Pechenga Inlet, 18 miles from the Arctic seacoast and 65 miles northwest of Murmansk, the terminus of the Murman Railroad. A new wagon road, built since the outbreak of the world war, connects Pechenga with Kyro, 100 miles to the southwest. From Kyro a fair road, over which an automobile has passed, leads to Rovaniemi, the northern terminus of the Finnish Railway which runs to Kemi, 65 miles distant, at the head of the Gulf of Bothnia (see map, page 332).

Photographs by Nathalie Loubovitsky

WE WOULD CALL THIS CAMPING OUT IN AMERICA, BUT IT IS THE STERN REALITY OF LIFE RATHER THAN RECREATION ON THE KOLA PENINSULA

When the old régime sent settlers to the Murman Coast, each family was promised 2,000 rubles as a household nest-egg, but even with this bonus the frugal peasants failed to find life attractive.

Photographs by Nathalie Loubovitsky

MONKS OF THE SOLOVETSKY MONASTERY AT PECHENGA

Founded in the sixteenth century by a hermit known as "Holy Trifan," the monastery was destroyed by a Swedish invasion early in the seventeenth century. In the nineteenth century it was restored under the direction of Father Jonathan, a simple peasant who spent thirty years at Pechenga and died in 1915, leaving the monastery as a powerful agency for civilization.

A TAILORING SCHOOL IN PECHENGA CONDUCTED BY MONKS

The pupils are placed in the monastery of this Murman settlement for a year or two at a time in fulfillment of religious vows made by their parents. Children came from places 1,000 miles distant before the world war. Pechenga is a fair-sized village with macadam roads. The wagon road to Rovaniemi (see also page 341) can be traveled at any time of the year, but is best in winter.

Photographs by Nathalie Loubovitsky

A LAPP AND HIS BEST FRIEND

What the banana is to the native of Central America and the palm tree to the dweller in the Saharan oasis, the reindeer is to the Lapp. This animal furnishes both food and clothing to his herder, and in addition is the native's sole means of transportation over miles of snow and ice.

A WELL-TO-DO WOMAN OF THE MURMAN COAST

The population of the Kola Peninsula is composed of two groups—the natives and the immigrants. The aborigines are Lapps. They are widely distributed, both on the coast and inland. While civilization has affected them only slightly, they are nominally Christians as the result of the efforts of Russian missionaries.

Photographs by Nathalie Loubovitsky

HAY AND GRASS GROW ABUNDANTLY DURING THE BRIEF SUMMER MONTHS, WHEN THE SUN SHINES ALMOST CONTINUOUSLY "NIGHT" AND DAY

Most of the northern coast of the Kola Peninsula is a vast expanse of bogs, but where there is natural drainage the vegetation is luxuriant during the few weeks when the sun is constantly above the horizon. Small quantities of potatoes, rye, and barley are also raised.

A MONK OF PECHENGA (TO THE RIGHT) AND A WORKMAN EMPLOYED AT THE MONASTERY ROWING OUT TO MEET A PASSING STEAMER

The religious recluses in this outpost of Christianity derive some income from the down of the eider ducks which they gather on the near-by Aino Islands. The eider-down is collected without destroying the nests or frightening the birds.

Photographs by Nathalie Loubovitsky

"SUN-KIST" SEA FOOD ON THE MURMAN COAST

The natives have only two ways of preserving fish—to salt them in barrels and to dry them in the sun. When the salt supply runs low and the sun fails to shine, quantities of food spoil.

SNOW SISTERS ON THE KOLA PENINSULA

The winter lasts long and the spring is late, cold, and rainy in this part of the world. Snowstorms are not infrequent in June, and in mid-winter, in the forests, snowdrifts 15 and 20 feet deep are encountered.

THE CITY OF THE DEAD IN PECHENGA

Monuments erected to the monks of the famous Greek Church monastery founded by the "Holy Trifan" in the sixteenth century.

Photographs by Nathalie Loubovitsky

LADIES OF LAPLAND

The two women with the tall hats are married. Those with the scarfs are débutantes. The youngest, the one with the striped waist, is fifteen years of age. The Lapps are a semi-nomadic people, depending largely on their reindeer herds for food and winter clothing. They comprise a large element of the population of the Murman region.

FISHERMEN'S HUTS BUILT UPON SAND AND SNOW: MURMAN COAST

It matters not whether their foundations are shifting, as they are for use through the summer stay only.

Photographs by Nathalie Loubovitsky

THERE IS LITTLE TO ENLIVEN HUMAN EXISTENCE HERE—NOT EVEN A MOVIE EVER FLICKERS

The temperature sometimes rises to 80 or 90 in the shade in summer and will last for a week. Then a strong northeast wind sends the mercury down to 45 degrees. The temperature is affected by the icebergs which are brought down by the cold currents from the north.

began January 1, 1915, with the appointment by the Russian Government of Vladamir Goriachkovsky as the engineer. At his disposal were placed 100,000 workmen recruited from all parts of the empire.

The line had to run through a terrain presenting the most discouraging difficulties—swamps, bogs, frozen lakes, and almost impenetrable forests.

In Russia's peril, construction work could not wait upon the advent of spring. Soundings were made through the ice by means of long iron rods to determine earth contours, in order to establish the safest roadbeds in swampy country. Much of the surveying during the long nights of the Arctic winter had to be done by lantern light.

The German propaganda bureau spread reports of frightful mortality among the workmen, but as a matter of fact, although the laborers lived under the most primitive conditions, in tents, the death rate was extremely low. About one per cent of those taken ill succumbed to scurvy.

It is true that when the first trains began to run over the partly completed road there were occasions when the track suddenly subsided, due to the fact that the rails had been laid upon what were thought to be rocks, but which proved, with the thaw of spring, to be ice. Under the circumstances, however, these mishaps were comparatively rare, and no serious accidents resulted. The swampy character of the right of way is indicated by the fact that there are 1,110 bridges on the line.

To maintain American and Allied troops operating along the Archangel-Vologda line in the winter of 1918-1919, when the harbor of Archangel was sealed, supplies were shipped by steamer to Murmansk, where they were unloaded and sent by rail to Kandalaksha, a distance of 170 miles, and thence transported by sledges across the frozen White Sea to Archangel, 200 miles to the east.

MURMANSK'S DAY IN THE SUN

Even before the boom occasioned by the decision of the Allies and America to dispatch an expeditionary force to Russia, Murmansk had grown to be quite a settlement, with its 3,500 to 4,000 inhabitants augmented from week to week by refugees whose number fluctuated from a few hundred to 3,000.

As was the case with all building operations in the empire, the Russian Revolution interfered materially with the growth of the port, which is situated on the east bank of the Kola Inlet, 30 miles south of the Arctic shore. Most of the buildings are of one story and are constructed of unhewn logs, chinked with native moss. The streets under the Russian régime were entirely of dirt. On both sides of the inlet, which is one and a half miles wide at this point, hills rise to a height of several hundred feet. The harbor is unobstructed by hidden rocks or shoals, and the ship berths can accommodate the largest ocean-going freighters.

The Murman (a corruption of Norman) is the name given to the 260-mile stretch of Arctic seaboard which forms the northern boundary of the Kola Peninsula, a vast plateau having an average elevation of 1,000 feet and covered with swamps, peat-bogs, forests, and lakes, lying almost entirely within the Arctic Circle and embracing an area as large as England and Wales combined.

Before the war the Murman Coast was practically uninhabited throughout the greater part of the year. In summer, however, Lapps and Russian fishermen from Archangel and the Pomorya district (lying west of the White Sea) formed fishing communities to take advantage of the bountiful schools of salmon, cod, and herring off shore.

The Lapps live in the interior of the peninsula in winter, tending their herds of reindeer, which furnish them with food, clothing, and transportation. In times of peace there is a considerable lumber industry, but otherwise the peninsula is comparatively non-productive, as only the scantiest crops of rye, barley, potatoes, and hay can be grown. The animal life is similar to that of most other high latitudes, including foxes, bear, martens, otters, elk, deer, and hares.

Mosquitoes are a serious pest in summer, even the reindeer being forced to flee to the high ground of the Chibinski Mountains, near the middle of the peninsula, to escape the harassing swarms.

ON THE TRAIL OF A HORSE THIEF

By Herbert W. Gleason

YES, he was a genuine Horse Thief, and we followed his trail for over 100 miles. But we never caught up with him! Hence it may be well to advise the expectant reader, at the very outset, that this tale is utterly barren in respect to those exciting episodes in which six-shooters are wont to play a prominent part, ending with a limp figure strung up to a tree.

There were two reasons why we never caught up with the Horse Thief. First, he had twenty years the start of us; and, secondly, we hadn't the remotest interest in the Horse Thief himself, even if at any time we had been close upon his heels; but we were tremendously interested in his trail.

THE COURSE OF THE MIGHTY COLUMBIA

The Columbia River is a mighty stream, and throughout its entire length of 1,400 miles it possesses a variety and depth of interest hardly to be surpassed by that attaching to any other river on earth. Although only half as long as the Mississippi, so many and so important are its tributaries that it fairly equals the latter stream in the volume of water which it pours into the ocean.

Few great rivers follow so devious a course. Rising in the Kootenay District of British Columbia, it first flows in a northwesterly direction for 200 miles; then it makes a sharp bend and flows due south for nearly 300 miles, halting on the way to form the famous Arrow Lakes; next it crosses the International Boundary into the State of Washington, where, for a distance of 600 miles, it turns and twists toward every point of the compass, as if it were seeking to bestow the blessing of its waters upon every portion of the great "Inland Empire," as the fruitful plains of eastern Washington are called.

Just before reaching the Oregon boundary it receives the waters of the Snake River, whose source lies 950 miles away in Yellowstone Park.

Then, with its breadth increased in many places to a mile or more, it follows a general westerly course for 300 miles, forming the dividing line between Oregon and Washington, and finally, as it approaches the ocean, it broadens out into a superb bay, 25 miles long and from 5 to 9 miles wide, ever maintaining its current against the ocean tides, although the influence of the tides is felt as far back as the Cascades—160 miles from its mouth.

Around this lower stretch of the Columbia there clusters a wealth of romance, Indian legend, historical interest, and heroic commercial enterprise. Here, too, the scenic beauty of the river, which is marked throughout its entire course, reaches its climax. Right through the lofty Cascade Range the river cuts its way—a feat which no other river for a distance of 1,200 miles along the range is able to accomplish.

To one traveling by steamer over this portion of the river, or speeding along the newly completed Columbia Highway by automobile, there is unfolded a continuous panorama of marvelous beauty. The Dalles, Celilo Falls, Castle Rock, Cape Horn, Multnomah Falls, Rooster Rock, the Cascades, Oneonta Gorge, Table Mountain, St. Peter's Dome—these are but a few of the many points of interest which delight the eye and uplift the soul.

AN EXPLORER THREE MONTHS TOO LATE

Crowning all, there are the three great "Guardians of the Columbia," as they have been called—Mt. Hood, Mt. Adams, and Mt. St. Helens—huge extinct volcanoes (or possibly they are only slumbering), whose snowy crests pierce the azure at elevations from 10,000 to 12,000 feet above the sea.

Now, the Lower Columbia, with its historical associations, its scenic grandeur, its thriving cities, its extensive fisheries and fruit ranches, has long been famous; but it is only within a few years that the

Photograph by H. W. Gleason

AT THE HEAD OF HORSE THIEF CREEK (SEE PAGE 352)

Proceeding from an enormous glacier which reaches far back into the mountains, the "creek" is a full-fledged mountain river at its very birth.

region around the *source* of the river has received any public attention. To be sure, David Thompson, the noted English explorer, spent a winter on Lake Windermere as long ago as 1810 and built there a fort to defend himself against the Indians—an event of no slight historical importance; for Thompson, whose purpose was to establish English interests in control of the Columbia, descended the river the following season only to find, when he arrived at the mouth of the river, the American flag waving at Astoria. He was three months too late.

Although Thompson afterward wrote an account of his Windermere sojourn and made a rough map of the neighboring region, nearly a century elapsed before the Upper Columbia Valley was known to any except a few ranchers and adventurous miners. Only within several years past has it been possible to reach the valley by railroad, and no detailed map of the country has as yet been made.

THE SOURCE OF THE COLUMBIA

The Columbia River finds its source in two lakes—Lake Windermere and Upper Columbia Lake—which lie in the broad basin separating the main range of the Rocky Mountains from the Selkirks at a point about 80 miles north of the International Boundary. The valley here trends north and south and is some three or four miles wide, being flanked on the east by the foothills of the Rockies and on the west by outlying summits of the Southern Selkirks—sometimes called the Purcell Range. Each range is pierced by deep canyons, through which flow jubilant mountain streams that seem glad to add their volume to the flood of the Columbia.

The floor of the valley is remarkable for its park-like character. The larger trees—mostly Douglas spruce and yellow pine—never form forests, but stand apart, each with plenty of room, while the aspens and alders and various shrubs are grouped gracefully here and there, with a profusion of wild flowers occupying the open spaces.

This park-like aspect is naturally much enhanced by the lake scenery. The two lakes are nearly equal in size, each covering an area of four or five square miles. Lake Windermere is the more picturesque of the two, its winding shores being emphasized by a series of bluffs, prettily terraced, which rise 50 feet or more above the level of the lake (see page 353). The Upper Lake, a few miles farther up stream, is the real beginning of the Columbia.

Both lakes are charming in outline, and present, under varying conditions of storm and calm, sunlight and shadow, a never-ending succession of pleasing effects. Seldom does one find a combination of mountain, lake, and open woodland so profoundly appealing and so commandingly beautiful. Especially noteworthy are those days when there is a gathering of the clouds, now on one range and now on the other.

Such variety in form, such majesty and yet delicacy of outline, such pearly transparency—and then again such leaden density—of substance, such brilliant illumination, such marshaling of glory—it is all beyond the power of words to describe.

The climax of beauty, however, comes in the early fall season, when the trees and shrubs have donned their brightest raiment and there is a riot of color throughout the valley and on the parallel slopes of the mountains—save on the extreme summits where rests a coverlet of new-fallen snow.

DAYS OF HOLY CALM

Day after day of holy calm prevails. The winds have ceased even their whispering, and the lake surfaces reflect with startling exactness every feature, whether of form or color, of the surrounding landscape. One standing by the lake shore at such a time may almost hear the antiphonal chant of rejoicing flung across the valley from one mountain range to the other, and sodden indeed must be the soul which does not feel itself uplifted by the supernal beauty.

As indicated above, the iron horse has at last found its way to the Upper Columbia Valley. Previously the trip was made by steamer from the town of Golden, on the main line of the Canadian

Pacific Railway. And what a trip that was! Only some 85 miles in total distance, it consumed the better part of two days' time; for the little river steamer, flat-bottomed and with a draft so light that it could pass over sand bars which were covered with only a few inches of water, was at the mercy of the persistent and tortuous current, with the result that it would frequently poke its nose now into one bank and now into the other, in utter disregard of helm and helmsman.

Even so, to the traveler delighting in Nature's beauty the trip was over all too quickly; for the magnificent double panorama through which the steamer passed—the Rockies on one side and the Selkirks on the other, their lofty summits clad in perpetual snow and their steep escarpments tinted with ochres and purples, and even vermilion—formed a vision of ceaseless charm.

More than one voyager has declared that this trip up the Columbia far exceeds in beauty anything which the Rhine has to offer. If one can afford the time, by all means let the journey be made by steamer. Next to that, by automobile.

A splendid road has recently been constructed by the provincial government through the entire valley, and still another automobile highway, of wonderful scenic interest, has been built over the mountains from Banff to Lake Windermere.

THE TRAGIC STORY OF HORSE THIEF CREEK

It was in this region that we followed the Trail of the Horse Thief. We were told that some score of years previous, after gathering his four-footed plunder, he had gone up the valley and then turned westward into one of the side canyons, intending to take his horses over the mountains and down into Montana.

But on reaching the head of the canyon he found his way barred by lofty mountains, hung with tremendous glaciers. Caught in this cul-de-sac, he was easily apprehended by the officers of the law, who dealt with him according to his deserts and restored the horses to their rightful owners. Ever since, the stream which flows through the canyon by which he sought to make his escape has been known as Horse Thief Creek.

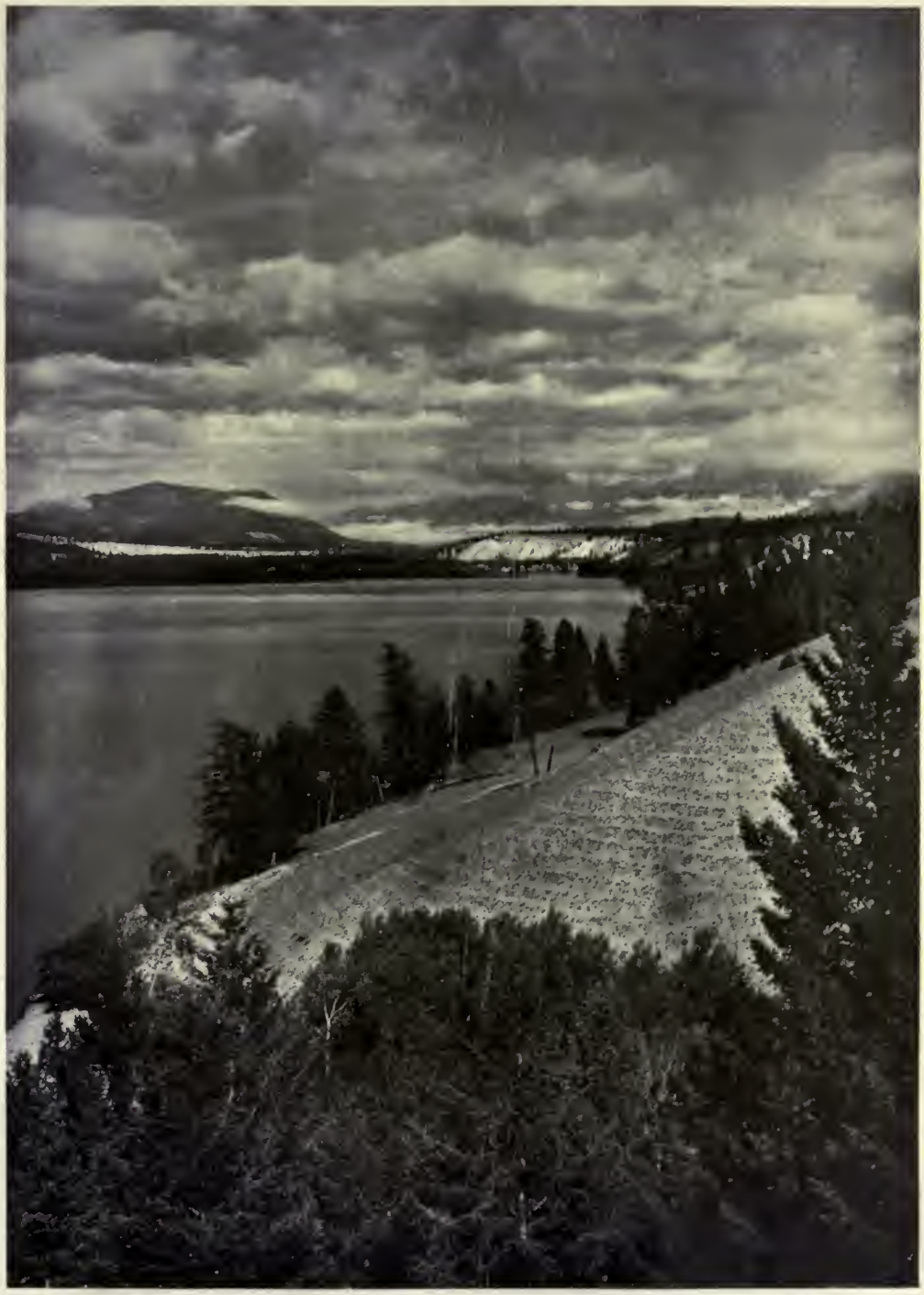
One bright day in August a party of four of us arrived at Lake Windermere. For two or three days we gave ourselves up to the enchantments of the lake and its surroundings; and then, with saddle horses and pack outfit, we started up Horse Thief Creek. Entering the canyon, we found ourselves on a high bench overlooking the stream, whose volume and roar seemed to belie the appellation of "creek." It was really a huge mountain torrent, in places 30 or 40 yards wide and tossing its waves in the unbridled energy of its current (see page 350).

A BATTALION OF "HOODOOS"

Evidences of its activity in sculpturing the walls of the canyons were everywhere apparent. In one place there was a regular battalion of "hoodoos"—fantastic pinnacles of mixed clay and gravel, the result of a curious process of erosion. In another place the river found its way through a narrow gorge, with vertical walls 300 feet deep. Now and then we caught a glimpse of a waterfall or boiling cascade—indeed, there were but few quiet places along the lower stretch of the river.

As we approached the head of the canyon, after passing through an extensive forest of mountain hemlock and fir, we suddenly came out upon a scene of rare sublimity. Here was a great amphitheater, surrounded by noble peaks belonging to the highest crest of the Selkirks, their lower slopes clad with a luxuriant dark-green forest, while from their snow-enshrouded summits descended here and there sparkling glaciers of utmost purity.

Wonderful above all else was the magnificent ice-stream which coursed down from a vast snow-field directly in front of us. Swinging from behind a rocky promontory in the form of a gigantic letter "S" it came down to the very floor of the valley—obviously the main source of the river whose course we had been following—while towering above all was a superb "snow dome" of dazzling whiteness. And there was music all around us. Standing in one spot, we counted no less than eight distinct waterfalls leaping



Photograph by H. W. Gleason

BLUFFS ALONG SHORE, LAKE WINDERMERE (SEE PAGE 351)

The winding shores of Lake Windermere are emphasized by a series of bluffs, prettily terraced, which rise from the lake level.

Photograph by H. W. Gleason

UPPER COLUMBIA VALLEY, LOOKING NORTH FROM SWANZEY PEAK

The Upper Columbia Valley trends north and south, separating the main range of the Rocky Mountains from the Selkirks. This view is taken from one of the higher foothills of the Rockies overlooking the valley.

Photograph by H. W. Gleason

LYALL'S LARCHES AT LAKE MAYE: COLUMBIA RIVER REGION

Lake Maye is a lovely sheet of water, pearly blue in color, about two miles in length and a mile in width, completely surrounded—except on the north side—by majestic mountains bearing a whole series of superb glaciers, from whose fissures and crevasses gleam sapphire tones of exquisite beauty. Directly opposite, across the lake, there is a magnificent piedmont glacier, fully a mile wide, with a notable medial moraine and a long succession of transverse crevasses. From this glacier, which comes down into the lake, there occasionally break off great blocks of ice, accompanied by a thunderous roar, and the icebergs, as they float around the lake, often present quaint and curiously sculptured forms.

Photograph by H. W. Gleason

FOOT OF PIEDMONT GLACIER, LAKE MAYE

At the head of Lake Maye there lies this splendid example of a piedmont glacier—the active agent in byegone ages in carving out the immense amphitheater in which it is located.

Photograph by H. W. Gleason

AMONG THE CREVASSES ON PIEDMONT GLACIER ABOVE LAKE MAYE

"Some of the crevasses we could jump across, but more often there was the necessity of making long detours around the ends of the yawning chasms. In many cases these crevasses were of appalling depth, and while we could not but admire the wonderful azure of their deep, converging walls, they all evinced a certain receptive attitude which was somewhat disconcerting to a 'tenderfoot' and led us to be extremely alert in negotiating slippery places. Happily the glacier was 'dry'—that is, not covered with fresh snow, which often conceals the jaws of the crevasses and makes crossing a glacier exceedingly hazardous—so that all possible danger was perfectly obvious and readily avoided."

from the heights above and cascading to the river in a chorus of joyous song.

Camp was soon made on a grassy plot by the river bank, sheltered by a grove of young firs and close to a delicious spring of clear, cold water. From here we made many excursions to glacier and mountain top.

One morning we took an early start by candle light, ascended the great Horse Thief Glacier, and after some hours of hard work, enlivened by many interesting episodes, succeeded in reaching the summit of a high peak that had attracted us for several days.

This was clearly the first time human feet had ever stood upon the summit, and we were rewarded with a view of alpine grandeur rarely equalled. In every direction, as far as the eye could reach, there extended a perfect ocean of snow-capped peaks, ranging from 10,000 to 12,000 feet in altitude—nameless, nearly all of them.

Realizing that any one of these thousands of peaks, if it were standing in the neighborhood of a great city, would be famous the world over, and that a great part of the region in the midst of which we stood was still awaiting exploration, we felt almost as if we were discoverers of a new continent. Unfortunately, forest-fire smoke, which had crept in during the night, dulled to a considerable degree the clearness of the view and rendered our cameras useless.

From careful aneroid measurements, we calculated the height of the mountain to be about 11,200 feet. We named it "Mt. Bruce," after a leading citizen of Windermere Valley.

Our chief object on another excursion was to climb Mt. Jumbo—a feat which no one had ever accomplished.

Starting as usual, before daybreak, we scrambled over the lower slopes of Jumbo Glacier without much difficulty, but before long we found ourselves entrapped in a maze of seracs, or ice pinnacles, which compelled slow and very careful progress. This caused us to take to the rocks, and at length, with the aid of the rope, we succeeded in reaching the steep rocky slope to the left of the glacier and then on to the summit of the ridge.

Arrived here, the bright sunshine with which we had thus far been favored seemed inclined to desert us, and ominous clouds were seen rising in the southwest. We chose to push on, however, for from this point it was simply a long pull across the snow-field to the base of the final peak. So we roped up and started. For an hour we made rapid progress, carefully avoiding the many concealed crevasses and feeling confident of attaining our goal.

But meanwhile the clouds had been gathering in increasing array, and when within only half an hour of the final summit a terrific blizzard struck us full in the face. Enveloped in a blinding snow, driven by the wind, it was impossible to stand against it or even to see our way more than a few feet ahead.

There was no possible alternative. We simply had to turn our backs to the storm and retrace our steps across the snow-field—defeated!

Such an experience, while disappointing, is to the true mountaineer simply "a part of the game," and he looks for better luck next time. But the "next time" did not come for us on this trip. For three days we lingered in camp, waiting in vain for the clouds to clear away.

But the weather as a whole continued decidedly unfavorable, and meanwhile a vast quantity of fresh snow had fallen on the mountain tops, making high-altitude trips quite out of the question. So we regretfully packed up our belongings and hit the trail back for "civilization."

"Going to the mountains is going home," was a favorite phrase with John Muir, the beloved evangelist of outdoor life, and from this text he was wont to preach most eloquently and convincingly. Happy are those who have discovered this truth; for it means not merely physical recreation and esthetic delight, but a keen mental stimulus—a new sense of the real values of life and a blessed inspiration toward better things.

America possesses exhaustless resources for those who are desirous of "going home," and some of the greatest and most satisfying of these are to be found in the region where we followed the Horse Thief Trail.

THE TEN THOUSAND SMOKES NOW A NATIONAL MONUMENT

The President of the United States Sets Aside for the American People the Extraordinary Valley Discovered and Explored by the National Geographic Society

THE members of the National Geographic Society have occasion for much gratification in the fact that President Wilson has created the Katmai National Monument, embracing an area of 1,700 square miles in Alaska, as the result of the five expeditions which the Society sent to this region for the purpose of studying the effects of the great Katmai volcanic eruption in 1912.

The findings of the National Geographic Society's expeditions, published in the NATIONAL GEOGRAPHIC MAGAZINE for February, 1913, January, 1917, and February, 1918, comprise all that is known about this remarkable region which Prof. Robert F. Griggs, leader of the 1915, 1916, and 1917 expeditions, has described as one of the greatest wonders, if not the greatest, of the natural world.

The Valley of Ten Thousand Smokes, an awe-inspiring phenomenon, where the processes of Nature in the creation of areas suitable for man's habitation may be studied as they can be in no other spot on earth, was discovered and named by Professor Griggs' party in 1916. The next year it was partially explored. During 1919 it is hoped that this monumental research work can be completed (see page 366).

AMERICA'S GREATEST NATURAL-WONDER PLAYGROUND OF THE FUTURE

Realizing that when means of transportation are improved, the Katmai territory will become the great natural-wonder playground of America, President Wilson, on the recommendation of the Secretary of the Interior, Franklin K. Lane, and of the Director of the National Park Service, Stephen T. Mather, has set it aside for all the people for all time in the following proclamation:

WHEREAS, There exists upon the southern coast of Alaska a belt of unusual volcanic activity which has during the last several years exhibited at various points energy of a violence which attracts the special attention of scientific watchers,

AND WHEREAS, Mount Katmai, one of the volcanoes in this belt, has proved upon investigation to have unusual size and character, and to be of importance in the study of volcanism, inasmuch as its eruption of June, 1912, was one of excessive violence, ranking in the first order of volcanic explosive eruptions and emitting several cubic miles of material during its first three days of activity,

AND WHEREAS, The results of this eruption are still fresh, offering excellent opportunities for studying the causes of the catastrophe and its results and affording a conspicuous object-lesson in volcanism to visitors interested in the operation of the great forces which have made and still are making America,

AND WHEREAS, The volcanic neighborhood is shown by the explorations of the National Geographic Society to contain many other striking features of an active volcanic belt produced so recently that they are still in the formative stage; and in particular The Valley of the Ten Thousand Smokes, a valley of hot springs in a condition of development toward a possible future geyser field, in distinction from the present dying geyser field of the Yellowstone,

AND WHEREAS, This wonderland may become of popular scenic, as well as scientific, interest for generations to come, inasmuch as all its phenomena exist upon

Photograph by Paul R. Hagelbarger

NOVARUPTA AND FALLING MOUNTAIN IN 1918

No change during a year's interval could be detected. Throughout the three years since its discovery, Falling Mountain has continued to send great boulders bouncing down its precipitous slopes in such rapid succession that one avalanche of galloping boulders hardly reaches the bottom before another breaks loose from the summit. Never has an observer had to wait five minutes for a new discharge.

a scale of great magnitude, arousing emotions of wonder at the inspiring spectacles, thus affording inspiration to patriotism and to the study of Nature,

Now, Therefore, I, Woodrow Wilson, President of the United States of America, by virtue of the power and authority in me vested by section two of the Act of Congress entitled "An Act for the Preservation of American Antiquities," approved June 8, 1906 (34 Stat., 225), do proclaim that there are hereby reserved from all forms of appropriation under the public-land laws, and set apart as the Katmai National Monument, certain lands particularly described as follows, to wit, beginning at the United States Coast and Geodetic Survey triangulation station, latitude 57° 52′ 17.040″, longitude 155° 05′ 20.331″, established in 1908 about one-half west of Katmai Bay on top of a hundred-foot bluff on the Alaska Peninsula, named Cape Kubugakli; thence north 40° 00″ west to the intersection with longitude 155° 40′; thence due north to the intersection with latitude 58° 35′; thence due east to the intersection with a line bearing north 60° 00′ west from Cape Gull; thence south following said line to the shoreline at Cape Gull; thence west following the shoreline of the coast to a point directly below the triangulation station, situated on the bluff at Cape Kubugakli; thence up the bluff to the said station, the point of beginning; embracing approximately 1,700 square miles of land, as shown upon the diagram hereto attached and made a part of this proclamation.

Warning is hereby given to all unauthorized persons not to appropriate or injure any natural feature of this monument or to occupy, exploit, settle, or locate upon any of the lands reserved by this proclamation.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument, as provided in the Act of Congress entitled "An Act to Establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat., 535).

In Witness Whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done in the District of Columbia this twenty-fourth day of September in the year of our Lord one thousand nine hundred and eighteen, and of the Independence of the United States of America the one hundred and forty-third.

Woodrow Wilson.

By the President:
Robert Lansing, *Secretary of State.*

PREËMINENT AMONG THE WONDERS OF THE WORLD

All subsequent study and comparison confirms and deepens the opinion expressed in the accounts of the discovery of the Valley of Ten Thousand Smokes, that this and the associated volcanic phenomena stand preëminent among the wonders of the world. Search through the literature of volcanoes, and conversation with travelers who have visited all the show places of the earth, make it quite certain that nowhere else in the present-day world is there anything at all similar to this supreme wonder.

The unique character of the Ten Thousand Smokes is generally recognized by those who have given the matter consideration. But how long will they last? Are the vents really the chimneys by which exit is found for the emanations from a vast mass of molten magma that, having risen from the depths, has all but burst through the surface bodily? Or, are they due merely to the vaporization of surface water by the heated products of the great eruption? Are they likely to endure for a long time, or will they probably dwindle rapidly, as nature settles down again after the great cataclysm of 1912?

So far as the observations of a single year could do so, the studies of 1917 indicated that they were real volcanoes, whose probable life was to be measured by decades rather than by days or months. But no single season's work could settle these questions. It was considered highly important that a watch be kept on developments the succeeding year. Notwithstanding the absorption of every one's energies in the prosecution of the war last summer, it was considered advisable, therefore, to keep some record of their condition. Two members of the expedition of 1917, Jasper D. Sayre and Paul R.

Photograph by Jasper D. Sayre

PHOTOGRAPHING ONE OF THE FUMAROLES IN THE VALLEY OF TEN THOUSAND SMOKES, 1918

The condition of this, as of other fumaroles, was precisely the same as when last seen the year previously.

Hagelbarger, volunteered to undertake the journey and to extend the scientific studies begun on the previous expeditions.

This party entered the valley not by the route heretofore used from the Pacific, but from the Bering Sea and Naknek Lake. As they came in they were able to explore much country hitherto but little known, discovering three good-sized lakes not previously shown on any map, Lake Tom and the two Savonoski lakes. They found the Naknek route by far the best way to get supplies into the country, and opened a trail up to the Valley of Ten Thousand Smokes from the head of the lake.

The country is so smooth and open in this direction that they consider it possible to use a motorcycle with a side-car attachment as a substitute for man-back packing. If this proves practicable, the expedition of 1919 will be able to work with a degree of comfort undreamed of in former years.

THE TEN THOUSAND SMOKES UNCHANGED

When they came up into sight of the Valley of Ten Thousand Smokes they saw at once that its volcanoes had not changed appreciably in the year's interval. In almost every detail the Smokes were exactly the same as in 1917. The only change observed was in the discovery of two areas of mud pots, which, if present, were overlooked the year before (see page 366). The Cookstove, Novarupta, and all the big vents were in exactly the same condition as when last seen.

Falling Mountain continued its remarkable activity, shooting off hundreds of tons of rock daily. Never, during the three seasons since it was discovered, has there elapsed a five-minute interval during periods of observation when its slopes were quiet. Throughout all three years great falls of rock have followed each other in such rapid succession from its lofty precipices that one avalanche of galloping boulders hardly reaches the bottom before another breaks loose from the summit.

Thus, although a series of rock-falls would seem necessarily much more ephemeral even than a volcano, the cause responsible for these avalanches on Falling Mountain, whatever it may be, has been continuously operative over a long period. It is very much hoped that the work of the coming season may yield some explanation of this remarkable Falling Mountain top.

SMOKE HOT ENOUGH TO MELT ZINC

The party of 1918 made the first measurements of the temperatures of the vents. They were so much hotter than had been expected that in 1917 we had been entirely unprepared to measure the temperatures we encountered, and had to resort to general descriptive terms instead of the precise statements which we would have desired. But in 1918 the expedition was supplied with suitable pyrometers by the Geophysical Laboratory of the Carnegie Institution and made many records of temperature throughout the valley.

As was anticipated, most of the larger vents were found to be far above the boiling point of water. The valley is so hot that hot springs, or geysers, are quite impossible in most places because all water is instantly vaporized. Many of the vents were found to be above 300° C. (572° F.), while a number exceeded 400° C. The hottest, 432° C. (810° F.), shown on page 364, was hot enough to melt zinc with ease.

It is clear that the studies made thus far give no indication of any diminution in the Smokes, much less do they suggest a probable date for their extinction. It may be considered established, therefore, that the Valley of Ten Thousand Smokes is a relatively permanent phenomenon.

The pictures that have been brought back have been sufficient to convince the world that it is indeed one of the greatest wonders of nature. But only those few human beings who have been privileged to enter the awesome confines of this great nest of volcanoes can realize how inadequate the pictures really are and how poor the impressions they convey of the real character of this wonder of wonders.

Far better than still pictures would be "movies," by which it would be possible to give some idea of the size of the place and of the ever-changing character of its smokes; how they surge up around the

Photograph by Paul R. Hagelbarger

THE HOTTEST FUMAROLE FOUND IN THE VALLEY

This little crack had a temperature of 432° C. (810° F.), more than hot enough to melt zinc. Probably some of the big volcanoes were even hotter, but their centers could not be reached with the instruments available in 1918.

men as they work; how they come roaring out from the myriad vents; how their gases are collected for study; how their temperatures are measured; how the expeditions cook their meals in the puffing steam; how enormous the volcanoes really are and how tremendously hot.

The projected expedition of 1919 plans to secure a series of films portraying the remarkable features of the district. The members of The Society will be glad to know that the production of motion pictures has been put in charge of Emery C. Kolb, one of the celebrated brothers whose adventurous trip through the Grand Canyon is familiar to all.*

But even the movies must fall very far short of the reality. The valley is one of those things which must be seen and studied before its real majesty begins to make itself felt.

Thus far no mortal man has ever entered its portals save only the members of the Katmai expeditions of the National Geographic Society. To all of those who have been thus privileged has come the desire to share the great wonder that has been theirs. They have felt that their mission of making the place known to the world would not be accomplished until it became possible for any one to visit its borders and behold for himself the stupendous spectacle there spread before him.

It is a special gratification, therefore, to the members of the National Geographic Society that the President of the United States has made this region an integral part of the great system of American National Parks, which command the admiration of the world.

* See, in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1914, "Experiences in the Grand Canyon," by Ellsworth and Emery Kolb.

Photograph by Jasper D. Sayre

MEASURING THE TEMPERATURE OF A FUMAROLE

The temperature of this insignificant little hole was 300° C. (572° F.). Others in the same line near by ran above 400° C. (752° F.). The difference in temperature between the hot and cold junctions at opposite ends of the thermocouple sets up an electrical current whose intensity, recorded by the meter in the foreground, is a measure of the temperature.

PLANS FOR OPENING THE KATMAI DISTRICT

To many it will appear, doubtless, that the new Katmai National Monument is so remote that there is little possibility of its ever becoming a place of popular resort. But if one will examine the geographical situation of the area, he will see that it is far otherwise. It is much less remote and far more accessible than was the Yellowstone Park at the time of its creation. The difficulties incident to its exploitation as a show place are much less than those that have been so successfully overcome at the Grand Canyon, which thousands upon thousands of people visit without any realization of the problems that had to be solved ere their comfort and pleasure could be provided for.

Katmai and the Ten Thousand Smokes lie less than one hundred miles to one side of what is certainly destined to be the greatest tourist route in the world—the trip up along the Alaska coast by Kodiak and Cook Inlet into the interior via the new Government railroad now under construction.

From Kukak Bay, which is a fine harbor, suitable for the largest ships, it is but a scant 25 miles overland to the Crater of Katmai. If a suitable road were available, it would, therefore, be easy for one to leave a steamer after breakfast and in an automobile roll through the whole of the volcanic district in a single day, returning to his ship in time for dinner.

Few there are, to be sure, who would not be compelled by the wonders they saw to stop over until the next boat; but, so far as covering the ground is concerned, it would be only a short day's tour for a motor car.

The only problems are the road and the organization necessary to furnish the

A LITTLE SPUTTERING MUD POT

Although common in the Yellowstone Park, such phenomena are rare in the Valley of Ten Thousand Smokes, for the reason that the temperature of the latter is for the most part so high that water is instantly vaporized.

service required. The exploration of a route over the mountains for such a road is an important part of the program of the expedition the coming summer. If this quest is successful and a feasible route into the country be discovered, we shall begin to feel that the way is opened for the Katmai National Monument to become in fact, as well as in name, a real part of the National Park System, available, as it should be, for the perpetual enjoyment and education of the public.

THE SOCIETY'S EXPEDITION OF 1919

Realizing the importance to science of a further study of the mysterious forces at work in the Valley of Ten Thousand Smokes, the Board of Managers of the National Geographic Society has made a grant of $35,000 from the Society's Research Fund for explorations of Katmai during 1919.

Professor Griggs, who was the director of the National Geographic Society's Mt. Katmai expeditions of 1915, 1916, and 1917, and who supervised the work of the small expedition of 1918, will head The Society's expedition of 1919, which will be more elaborately equipped in every respect than any of the previous undertakings in this region.

Professor Griggs will have as his associates this year: Dr. E. T. Allen, of the Geophysical Laboratory of the Carnegie Institution, in charge of the chemical work; Dr. C. N. Fenner, of the Geophysical Laboratory, petrographer; E. G. Zies, of the Geophysical Laboratory, chemist; J. W. Shipley, chemist; Emery C. Kolb, motion-picture photographer; Frank I. Jones, photographer; J. S. Hine, zoölogist; Jasper D. Sayre, topographer; Paul R. Hagelbarger, topographer; Lucius C. Folsom, assistant to the director; D. B. Church, assistant photographer; A. J. Basinger, assistant zoölogist; Ralph Hagelbarger, Richard E. Helt, H. E. Jacob, August E. Miller, Julius Stone, Jr., H. N. Wallace, Charles Yori, and W. L. Henning, assistants.

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THE INDUSTRIAL TITAN OF AMERICA*

Pennsylvania, Once the Keystone of the Original Thirteen, Now the Keystone of Forty-eight Sovereign States

BY JOHN OLIVER LA GORCE

AUTHOR OF "THE WARFARE ON OUR EASTERN COAST," "ROUMANIA AND ITS RUBICON," ETC.

TO ATTEMPT a survey of the Commonwealth of Pennsylvania in a magazine article is akin to describing an empire on a sheet of note paper; for more than a dozen of the sovereign nations of the earth as they were in the years before the Prussian ran amuck were smaller in area, and more than half of the rulers of the world governed fewer people than live within the confines of that State.

With vast natural resources, immense industries, plus the unconquerable spirit of progress that tends to create local happiness and national well-being, the Keystone State, as it is proudly called, challenges admiration and stirs the imagination.

Measured in terms of our own country, Pennsylvania has many surprises for the investigator of its position in the Union. One might add the populations of four far-western States to that of all New England and still have fewer people than dwell in the land of William Penn. Draw a line from the Canadian border to the Rio Grande on the meridian that separates the Dakotas and Nebraska from Montana and Wyoming, and all of the people who live between that line and the shores of the Pacific would barely suffice to equal Penn-land's population.

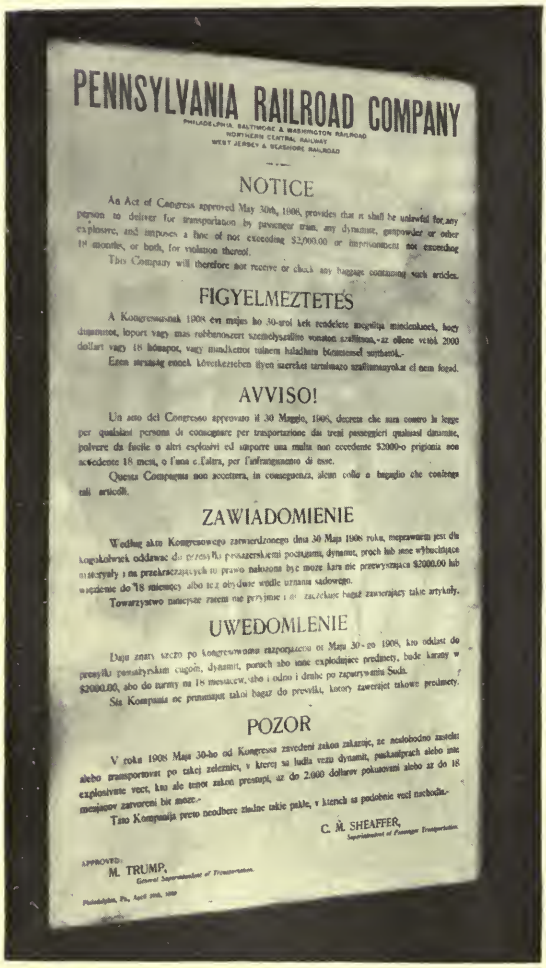
Traveling through the State, one quickly gathers the impression that it is peopled with foreign-born. Its vast industries have laid heavy drafts upon the labor markets of the world in times gone by, and for years not a ship that carried an immigrant to America came without a quota bound for the iron, steel, and coal centers of the Commonwealth.

MANY NATIONS HAVE CONTRIBUTED TO THE STATE'S ARMY OF LABOR

An analysis proves, however, that even with the influx of alien labor, Pennsylvania outranks every other State in the Union in the number of sons and daughters of native parentage. Even New York has a million fewer people whose parents were born under the ægis of the American flag.

Still, the State is distinguished for its great number of foreigners. No other State has so many Welsh, Austrians, or Hungarians. It has more Welsh than County Radnorshire, more Austrians than the Province of Salzburg, more Hungarians than any two cities in Hungary, Budapest excepted. It has as many English as the counties of Cambridge

* This is the first of a series of articles on Our States.



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NOTICE

An Act of Congress approved May 30th, 1908, provides that it shall be unlawful for any person to deliver for transportation by passenger train, any dynamite, gunpowder or other explosive, and imposes a fine of not exceeding $2,000.00 or imprisonment not exceeding 18 months, or both, for violation thereof.

This Company will therefore not receive or check any baggage containing such articles.

FIGYELMEZTETES

A Kongresszusnak 1908 évi május hó 30-ról kelt rendelete megtiltja minden olyan személynek, hogy dynamitot, lőport vagy más robbanószert személyvonaton szállítson, az ellene vetett 2000 dollárt vagy 18 hónapot, vagy mindkettőt ezekben a határokban büntetésül szabván.

Ezen szerint ennek következtében ilyen szerekkel terhelt poggyászt el nem fogad.

AVVISO!

Un atto del Congresso approvato il 30 Maggio, 1908, decreta che sara contro la legge per qualsiasi persona di consegnare per trasportazione dai treni passeggieri qualsiasi dinamite, polvere da fucile o altri esplosivi ed imporre una multa non eccedente $2000-o prigionia non eccedente 18 mesi, o l'una e l'altra, per l'infrangimento di esse.

Questa Compagnia non accettera, in conseguenza, alcun collo o bagaglio che contenga tali articoli.

ZAWIADOMIENIE

Według aktu Kongresowego zatwierdzonego dnia 30 Maja 1908 roku, zapraweszm jest dla kogokolwiek oddawać do przewozu pasazerskiemi pociągami, dynamit, proch lub inne wybuchające substancyały, a za przekraczających to prawo nałożona być może kara nie przewyższająca $2000.00 lub więzienie do 18 miesięcy albo też oby dwie wedle uznania sadowego.

Towarzystwo niniejsze zatem nie przyjmie i nie zaexhuje bagaż zawierający takie artykuły.

UWEDOMLENIE

Daju znaty vsem po kongresovomu razporjazenju ot Maja 30-go 1908, kto odklast do prevozhi parnabrzyskim vagoin, dynamit, porach ali inne explodnjee predmety, bude karany v $2000.00, ali do surmy na 18 mesatcev, ali i oduo i druhe po zapuryvanie Suda.

Sia Kompania ne prinumajut takoi bagaz do prevozki, kotory zaverajet takowe predmety.

POZOR

V roku 1908 Maja 30-ho od Kongresse zavedeni zakon zakazuje, ze neslobodno zasielat alebo transportovat po takej zeleznici, v ktorej sa ludia vezu dynamit, paskatrpach alebo inte explodivne veci, kto ale tenor zakon presupi, uz do 2,000 dollarov pokutovemi alebo az do 18 mesiacov zatvoreni bit moze.

Tato Kompanija preto neodbere ziadne take puble, v ktorich sa podobnie veci nachodia.

C. M. SHEAFFER,
Superintendent of Passenger Transportation.

APPROVED:
M. TRUMP,
General Superintendent of Transportation.

Philadelphia, Pa., April 30th, 1908

A LAND OF MANY TONGUES

The cosmopolitan make-up of the population of Pennsylvania is shown by the above notice in six languages, posted in railway stations, warning the public against the transportation of explosives on passenger trains.

and Oxford together; as many Irish as County Kerry; as many Scotch as County Clackmannan; as many Russians as the Government of Kharkov.

ESSENTIALLY A THRIFTY PEOPLE

Pennsylvanians are not alone distinguished because of the large numbers who boast of native ancestry, for an examination of the census returns dealing with the ownership of the homes of the people of the nation reveals the fact that it has more home-owners than any other State. They are essentially a thrifty people. Nearly seven hundred thousand families live under their own roof-trees—and the striking part of that situation is that most of these homes are mortgage-free.

Many men have essayed to look into the future of the American people to see what the United States will be when the nation reaches its maturity. Perhaps Pennsylvania can supply the answer. When one travels through the farming and industrial section of the southeast, visits the anthracite country of the northeast, wanders around through the splendid valleys of the central section, and then goes into the bituminous and manufacturing region beyond the Alleghenies, he marvels at the number of people who find there a homeland, and at the tremendous volume of business which has been developed.

Yet Pennsylvanians know that there is room in the State for millions more, and see no reason why the country at large cannot support a population as dense as that of the Keystone State today. Such a density of population would make ours a nation of half a billion souls—more people than inhabit the entire continent of Europe.

The manufacturing industry of the State is an epic of human energy. What bit of fiction could thrill more than the facts showing how one-twelfth of the people of the United States, the busiest nation on earth, can succeed in producing one-eighth of the Republic's manufactures and more than a fourth of its minerals! Or what story could appeal more than the one which tells how a district constituting only a thousandth part of the earth's land surface and possessing only one-half of one per cent of the earth's people produces one-sixth of the world's pig iron and the same proportion of its coal!

WHERE MANY INDUSTRIES THRIVE

Yet, with all of this concentration, Pennsylvania has a greater diversity of industries than any other State, leading

both New York and Illinois in that particular. This versatile geographic Titan forges the heaviest castings civilization has ever undertaken to make and the most delicate micrometers that science demands for traversing the realms beyond the millionth of an inch.

With equal success it fabricates tremendous testing machines that squeeze metals to the tune of millions of pounds, and makes watches whose balance-wheels measure time down to the hundred-thousandth part of a second, and chronometers that do, mayhap, even ten times better than that.

Wide-ranged, yet concentrated, famous for its heavy manufactures, distinguished for its light ones, demanding the most powerful forges in the world, requiring the most delicate turning machines, producing raw iron which formerly could be bought for less than a cent a pound, and finished steel worth, in some cases, hundreds of dollars an ounce, Pennsylvania commands admiration for her manufacturing industries and compels attention for her position in the commercial world.

© A. Lloyd Lewis

THE FIRST UNITED STATES MINT: PHILADELPHIA

The first production of this mint was the copper cent of 1793, followed the next year by silver dollars, and in 1795 by gold eagles. In addition to its modern coinage establishment in Philadelphia, the United States now has mints in operation in San Francisco and Denver. The nation's paper money is made in Washington.

Some one has observed that Pennsylvania bridges span most of the rivers of the earth, and that Pennsylvania locomotives run over Pennsylvania rails in the Occident and Orient alike, across Arctic wastes and through tropical jungles, through the heart of civilization and on the border of savage-land. The clatter of the iron pig of Pennsylvania is heard throughout the world, along with the squeal of the edible porker of Illinois.

The State makes nearly half of the country's cotton lace, more than a third of its carpets and rugs, more than a third of its chocolates and cocoa, nearly half of its felt hats, and more than a third of its silk. It produces more asbestos manufactures than all the rest of the country, and more bluing, ice cream, hammocks.

Photograph by J. Horgan

SUPERB IN SYMMETRY, ENDURING AS THE SURROUNDING HILLS: THE VIADUCT AT NICHOLSON, PENNSYLVANIA

As the leading State in the Union in the production of Portland cement, Pennsylvania employs it generously in the construction of bridges and viaducts. At Nicholson and Towanda are two of the most imposing concrete structures in the world (see page 381).

Photograph by William H. Rau

ALONG THE FLOWERY BANKS OF THE PLACID UPPER REACHES OF THE SUSQUEHANNA

Flowing now between steep and forbidding cliffs of towering granite, now between daisy-bordered banks, now through fertile farm lands, and now through swampy sections, the Susquehanna has a course of 500 miles, draining the greater part of Pennsylvania and serving many prosperous and populous cities. Harrisburg and Wilkes-Barre are the chief cities on its banks.

Photograph by W. H. Tipton

THE GETTYSBURG BATTLEFIELD FROM LITTLE ROUND TOP, SHOWING WARREN STATUE AND OVERLOOKING THE VALLEY OF DEATH TO THE WHEAT FIELD, PEACH ORCHARD, AND BLOODY ANGLE

It is a short 112 miles, in a direct line, from Independence Hall, where the American Union was born, to that fateful clump of trees on the battlefield of Gettysburg, where the "high tide of the Confederacy" began to recede and the Union was saved. The battlefield covers about 25 square miles, with the Union line stretching along Cemetery Ridge from Round Top to Culp's Hill, and the Confederate line paralleling it along the crest of the lesser Seminary Ridge. The 400 monuments on the field rise in gardens, by the roadside, on stony ridges, in the woods, in the open country, each telling a story of devotion to duty as each hero saw it. To assist students and sightseers in interpreting the historian's account of this, one of the decisive battles of the Civil War, the positions held by various commands have been clearly marked.

and leather than any other State represented on our starry flag.

A VERITABLE TREASURE-HOUSE

As might well be imagined, such versatility in its manufacturing industries, coupled with seemingly endless natural resources, has created great wealth. Therefore, when it is stated that the estimated true value of all the property in the Commonwealth amounts to more than fifteen billion dollars, on a pre-war basis of values, the mind fails to grasp its full meaning. But when one stops to consider that this is four billion dollars greater than the aggregate wealth of all New England and only five billion less than the national wealth of all Italy, the significance of the figure begins to appear.

With this epitome of the State's rôle as a component part of a powerful nation, one's interest turns to the elements of its greatness. Politics gave it the familiar sobriquet—Keystone State. Yet even politics is a matter of geography. Six colonies lay to the east and north of Pennsylvania and six to the south, so it was the geographical keystone of the embryo nation. The early development of its iron deposits and opening up of its coal mines made it preëminently an industrial keystone.

By the time its limited supplies of iron ore were exhausted the industries based thereon had become so well established that even the discovery of unprecedented deposits of ore in Michigan and Minnesota could not break the State's position of leadership in those fields. The Mountain of Manufacture refused to go to the Mahomet of Ore, so the Mahomet of Ore came down the Great Lakes to the Mountain of Manufacture.

Coal and limestone are as essential in the production of iron and steel as is the ore itself, and Pennsylvania has both in as great abundance as Minnesota has iron. Furthermore, heavy manufacturing seeks the neighborhoods of rich coal deposits as unerringly as the needle seeks the magnetic north.

THE VALUE OF A FAVORED LOCATION

By favor of location as well as by richness of resource, Nature made Pennsylvania a great State. Call the roll of the forty-eight commonwealths of the American Union and another will not be found that shares with the land of Penn the honor of being in navigable connection with three of the nation's water fronts—the Atlantic Ocean, the Gulf of Mexico, and the Great Lakes.

Through the Delaware River the shipping of the world may come to the very foot of the chief street of her principal city. Down the Ohio the wealth of her mines may float, through the very heart of the nation, to New Orleans and the Gulf of Mexico. At Erie are touched the broad waters of the unsalted seas, where the raw materials and the finished products of the West and East flow back and forth in the busiest water-borne commerce in the world.

With the Delaware River meandering southward in such a way as to give the State two great salients into New Jersey; bounded on the north by the forty-second parallel and a bit of Lake Erie; separated from Maryland and West Virginia by Mason and Dixon's Line, and from Ohio by one that runs nearly midway between the eightieth and eighty-first meridians, the State is a parallelogram except for the wandering course of the Delaware River, the arc of Delaware State, and the jog up to Lake Erie.

THE ROLL-CALL OF COUNTIES

From the Maryland line to the New York line is 158 miles, while from the Ohio line to the deepest salient in the Delaware River sector, between Trenton and Bristol, is 306 miles. The diversity of physical aspect, soil, and resource is great. Southeast of the Blue Ridge Mountains lies one of the finest agricultural regions east of the Appalachian chain. Franklin, Adams, Cumberland, York, Lancaster, Lebanon, Berks, Bucks, Montgomery, Chester, and Delaware—was there ever a group of counties with fairer farms than these possess?

Then come the eastern mountains and beyond, the wonderful succession of ridge and hollow that embraces the anthracite mines, the slate quarries, the cement rock beds, and so much else of the State's resources. Further westward is the great Allegheny upland region, whose deposits

OIL CITY AND THE ALLEGHENY RIVER

It was western Pennsylvania that taught the world the use of petroleum and sent that substance on its grand march around the globe. Situated 55 miles southeast of the Erie shore, Oil City is the center of the great oil district of Pennsylvania. It is estimated that in ten years there was a yield of sixty million barrels of oil from the valley of Oil Creek, which flows into the Allegheny River at this point. Although the present yield is inconsiderable, compared with the heyday of the oil flow, Oil City is still an important industrial center, with its numerous oil refineries, machine shops, and foundries.

of bituminous coal are richer than all the gold mines of the earth.

A CANAL EQUIPPED WITH AMPHIBIOUS BOATS

A high plain, undulating in wide, low swells, and gently descending southward and southwestward, this area comprises more than half of the territory of the State. Its oil and its gas have been almost exhausted under the demands of industry, but its coal mines go on and on, yielding more fuel in a year than all the world produced at the beginning of the American Civil War.

With its unequalled situation as respects the navigable waters of the nation, it was but natural that Pennsylvania should have early taken steps to develop her inland waterways. A hundred million dollars were spent in the building of canals to handle the State's commerce. Public appropriations and private funds alike were made available for the build-

Photograph courtesy Philadelphia Commercial Museum

NAVIGATING THE PENNSYLVANIA HILLS IN A BIFURCATED BARGE

A view of the old canal-boat inclined railway across the Alleghenies between Hollidaysburg and Johnstown. Over this route passed the traffic between Philadelphia and Pittsburgh a century ago.

ing of a network of waterways. As time went on, these spread out over the State like the branches of a tree.

The Schuylkill Navigation Company built a 108-mile canal up the Schuylkill River, and at one time had a thousand boats in operation. The Union Canal, from Middletown to Reading by way of Lebanon, was 77 miles long, with a 22-mile branch. It had more than a hundred lift-locks. Sixteen of these were in a tunnel just west of Lebanon, carrying the canal to Swatara Creek. The Monongahela was canalized by the construction of sixteen dams in order to form slackwater navigation.

The Main Line Canal, connecting Philadelphia with Pittsburgh, was in reality half canal and half railway. The journey began at Broad and Vine streets, Philadelphia. From there to Columbia, on the Susquehanna, sectional canal-boats and railway cars were hauled on wheeled trucks. There the boats were pinned together and towed up the Susquehanna and Juniata rivers to Hollidaysburg. Here they were put on an inclined railway, dragged up the mountain by steam winches, and let down by the same method to Johnstown. From there they proceeded to Pittsburgh through the Conemaugh, Kiskiminetas, and Allegheny rivers.

WAGING A LOSING BATTLE

Inadequately constructed to meet the competition of the railroads, as the latter transportation facilities improved and expanded, the canal system began to fail and now is practically in ruins. Everywhere one sees decaying locks and rotting canal-boats, relics of a remarkable era. But recently the strain of the tremendous volume of local and through

Photograph by William H. Rau

THE FAMOUS HORSESHOE CURVE ABOVE ALTOONA

Beyond Altoona, on the railway line from Harrisburg to Pittsburgh, the train gradually ascends to the summit of the Alleghenies. At Kittaning Point the line is carried around the famous Horseshoe Curve, where it crosses two ravines on a lofty embankment and cuts away the promontory dividing them. As the sides of the curve are parallel, trains which are seen to be moving in the same direction on opposite sides of the curve are actually bound for different terminals.

traffic is too great, even for the splendid railroad systems of the State, and there is a strong movement to rehabilitate the canal system and to extend it.

Tentative plans have been formulated to connect Pittsburgh with Lake Erie by a canal which will touch Ohio at Beaver, enabling the ores from Minnesota and Michigan to come into the Pittsburgh district by water, and the coal from the bituminous regions to float practically from the mouth of the mine to the Northwest. Plans have also been made to bring Philadelphia into touch with New York waters by a canal across Jersey from the Delaware at Trenton, to Raritan Bay at South Amboy.

It is almost impossible for the layman to realize what vast advantage there is in canal transportation for heavy and slow freight. It costs but little more to bring ore from Duluth, at the head of the fresh-water seas, to Erie and Conneaut and Ashtabula, nearly a thousand miles, than it costs to haul it from the Erie ore piles to the Pittsburgh furnaces, less than 125 miles.

CUTTING DOWN THE DISEASE HARVEST

In matters of health Pennsylvania has always been one of the forward-looking States. It long ago came to realize that the Commonwealth which is willing to give its

Photograph by J. Horgan

CITY HALL AND SOLDIERS' MONUMENT IN SCRANTON, PENNSYLVANIA

Probably no other city of its class in the world is richer than Scranton. Five billion tons of anthracite in the hard-coal region have been used or wasted, but fifteen billion tons have not yet been touched within a radius of two or three hours' ride of Scranton. Its prosperity is founded upon the civic pride of its people no less than upon its mines.

sanitarians adequate support can go before the world with a clean health slate. In 1906 the State's typhoid death rate was 56.5 persons for each 100,000 population. In 1915 it was 12.2. In other words, Pennsylvania's health agencies are rescuing 3,700 people from typhoid graves every year.

The same situation prevails with reference to tuberculosis. In 1907, 129.6 persons died of that disease out of each 100,000 population. In 1915 there were only 97.8 such deaths—a rescue of 2,600 people from tubercular ends each year.

Through a system of sanitary inspection of water supplies and sewage disposal; through its sanatoriums, its visiting nurses, and free medical aid for the tubercular; through its free antitoxin service in diphtheria and other diseases, and through the employment of all modern agencies for keeping the people free from contagion, the State has won the lasting gratitude of its citizens for the longer, better, and healthier lives it is enabling them to live.

MILLIONS OF SEEDLING TREES PLANTED

Only threescore years ago Pennsylvania was richly provided with forests. A former commissioner of forestry relates how in his youth he traveled through almost unbroken forests of splendid trees from the mouth of the Sinnamahoning to the Allegheny River at Warren—75 miles—and also from Clearfield via St. Marys to Smethport—60 miles. In his day, he says, he has seen one-seventh of the total area of the Commonwealth cut over and made barren and desolate.

Aroused to the necessity of saving her upland soils by restoring to the bare hills and mountain sides the trees that thoughtless industry removed, the State organ-

Photograph by Deck Lane

ONE OF THE EARLY IRON FURNACES IN PENNSYLVANIA

This primitive plant produced in two years less iron, perhaps, than the blast furnace, shown on the opposite page, can produce in a single day. The capacity of the modern furnace is about four hundred tons every twenty-four hours, and it is in operation 365 days and nights in the year.

ized a forestry bureau and acquired more than a million acres, which it is fast reforesting. Millions of seedlings have been planted and the work is but well begun. Corporations, the public schools, and institutions of many kinds have joined in a general movement to restore every acre of waste land to the condition which existed before the woodman's axe took such terrible toll of the timber resources.

No State in the entire Union has a broader or more comprehensive plan of highway building than the Keystone Commonwealth. Under a law passed eight years ago, 7,500 miles of highway were taken over, and recently a fifty-million-dollar bond issue was authorized. With local and Federal contributions, the amount to be spent will reach the enormous total of $125,000,000.

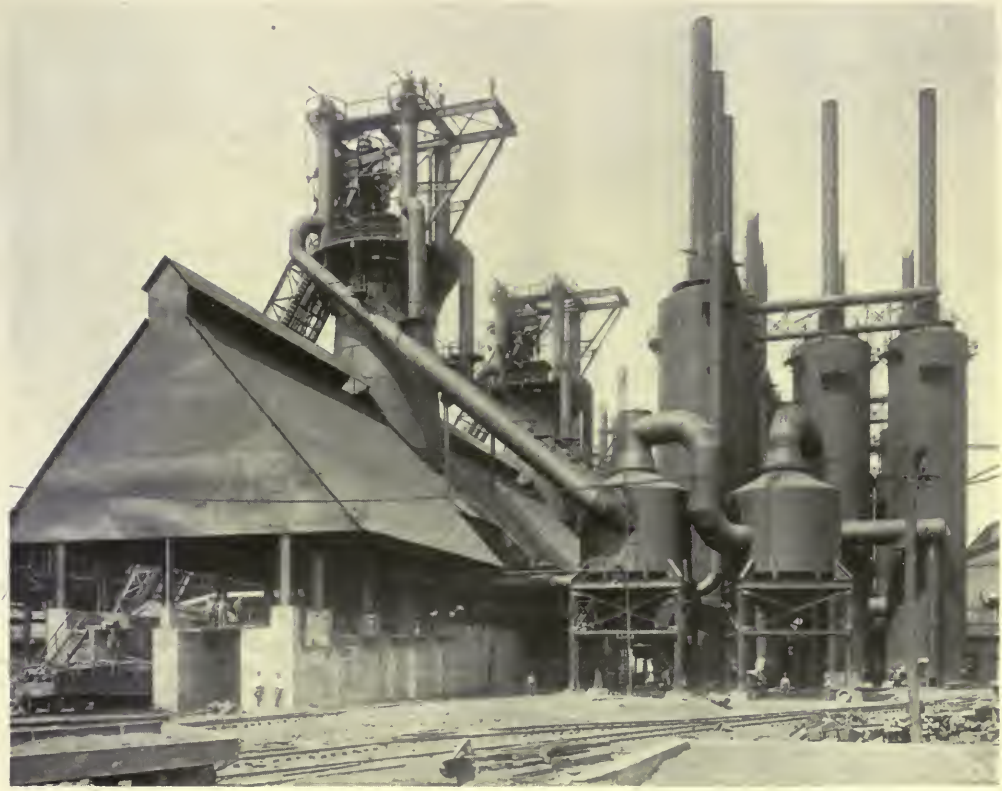
Under the plan now in force some three hundred routes are marked for improvement. These include the main highways between county seats, those joining the State roads of adjoining States, and those connecting principal cities and towns. They are under State rather than local jurisdiction.

In addition to bearing the entire burden of the construction and maintenance of intercounty and interstate highways, the State will furnish the counties with half the funds for improvement of local roads.

One who travels over such splendid highways as the new concrete road from Easton to Allentown will not fail to appreciate the Keystone State's splendid good-roads policy.

A NEEDED REFORM IN TEACHERS' PAY

The State authorities admit that the elementary educational system is not the best in the Union, and that there are many things that need to be done to bring its schools up to the highest standard; but the Governor and the Legislature are addressing themselves to the problem and propose to solve it.



A BLAST FURNACE OF TODAY AT SOUTH BETHLEHEM

Although the area of Pennsylvania is only one one-thousandth of the earth's land surface and only one-half of one per cent of the inhabitants of the globe reside within its borders, it produces one-sixth of the world's pig.iron and one-sixth of its coal.

Adequate pay for school teachers is one of the first items in the program. One can scarcely realize that there are in such a progressive State more than eleven thousand teachers receiving salaries of less than $500 a year—a sum that even an unskilled laborer would turn up his nose at today.

These teachers are pursuing a calling second in dignity and in usefulness to none. They are influential factors in the intellectual development of the future citizens of the State, and cannot but be handicapped in their work by the less-than-living wage they have been receiving.

Pennsylvania is joining the ranks of those States which realize what a debt American civilization owes to the faithful, overworked, and underpaid school teacher, and which understand that no investment can be made that will yield greater returns than the voting of living salaries for instructors.

In the realm of higher education, no State is better equipped nor has more vigorous institutions. The University of Pennsylvania has an enrollment of some 5,000 students, most of them from the State, but with a minority drawn from all of the other States and from some fifty foreign countries. It has 30,000 living alumni. The University of Pittsburgh possesses a department of industrial research and is one of the country's foremost engineering institutions. The Pennsylvania State College was once called "The Farmers' High School." Now it is a modern collegiate institution, with schools of agriculture, engineering, liberal arts, and natural science.

Lehigh University and Swarthmore both have famous engineering schools. Then there are Bucknell, Dickinson, La-

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CENTENNIAL CELEBRATION OF STEAMSHIP NAVIGATION ON INLAND WATERS, PITTSBURGH

While Pennsylvania has no seaboard, in the narrowly literal sense, its Lake Erie front gives it cheap water-freight connection with the Middle West; the Ohio and Mississippi provide an invaluable waterway to the Gulf of Mexico, and the Delaware River is the State's majestic gateway to transatlantic trade (see page 373).

fayette, Bryn Mawr, Franklin and Marshall, Washington and Jefferson, and many other institutions which have given many brilliant men and women to the nation. The Carnegie Technical School of Pittsburgh, with its elaborate engineering laboratories; the Drexel Institute of Philadelphia, with its fine course in the textile art, and Girard College, where an orphan boy is "mothered" and in due course sent out into the world with a college education in his head, a kit of tools on his back, and a "grub stake" in his pocket, are types of special schools of which there are a number in the State.

PENNSYLVANIA'S SHARE IN TWO GREAT INDUSTRIES

There is no part of the story of Pennland that is more striking or of greater significance than that relating to its industries. Modern civilization is based primarily on coal and iron. They enter into every truss and brace, every doorpost and cornice—indeed, into every element of foundation and superstructure of the edifice of human progress—for man has been able to rise from his primitive situation only as he has utilized them.

In the year that George Washington laid down the cares of life, the world was using per capita less than a bushel of coal and less than three pounds of iron, per annum. In the year before the Hun undertook his ill-fated program of making the whole earth his own, the average human being that inhabits the earth, whether South Sea cannibal or American business man, could claim four-fifths of a ton of coal and nearly ninety pounds of iron as his share of the world's output.

The story of Pennsylvania without an account of her share in these two great industries would be like Hamlet with the central figure forgotten. However, both have been so ably described in previous numbers of THE GEOGRAPHIC (see "Steel—Industry's Greatest Asset" and "Coal—Ally of American Industry," in the August, 1917, and November, 1918, numbers of THE NATIONAL GEOGRAPHIC MAGAZINE), that they are merely referred to, not described, here.

Another industry in which Pennsylvania was a pioneer is the manufacture of Portland cement. With the age of con-

Photograph courtesy Philadelphia Commercial Museum

TOBACCO FARM, LANCASTER COUNTY, PENNSYLVANIA

It is a familiar sight in this section of the State to see an old-fashioned "Amish" Mennonite, with his broad-brimmed hat and his "monkey-jacket" coat, contentedly puffing a big black cigar. He may "crucify the flesh" in his clothes, but he surely knows how to enjoy and produce a good smoke. In no Commonwealth of the Union is the versatility of industries or the variety of its people's interests greater than in Pennsylvania. Through farm and factory the same inspiring story of progress runs.

crete upon us, with buildings, bridges, lighthouses, telegraph poles, railroad ties, even ships, fashioned from artificial stone, that industry is proving one of inestimable value to the people. Millions of trees have been spared because of concrete, and thousands of acres of fine forest have been saved from the ravages of the sawmills because structures which formerly were built entirely of wood can today be erected without it.

THE STORY OF CEMENT IN PENNSYLVANIA

It is only a little more than half a century since all America's Portland cement came from across the seas—and comparatively little of it was imported for building purposes. This did not suit the ambitions of certain progressive Pennsylvanians in the Lehigh Valley, who decided to build their own kilns, and soon began to produce a cement that equalled the best that could be imported from abroad.

They found cement rock throughout a broad area in eastern Pennsylvania, of which the Lehigh district—above Allentown—is the center. To make Portland cement—which, by the way, derived its name from the fact that it resembles the English Portland limestone in color—alumina, silica, and calcium must be combined and prepared in a way that the finished product will "set" according to specifications. Clay, quartz, and lime in this district are the sources of these ingredients, although blast-furnace slag and other materials are used in some localities. In the valley of the Lehigh River from Siegfried to Easton are great beds

Photograph by William H. Rau

WISSAHICKON CREEK AT VALLEY GREEN: FAIRMOUNT PARK, PHILADELPHIA

With its more than 3,000 acres, Fairmount is one of the largest city parks in the world and is Philadelphia's special pride. It extends along both banks of the Schuylkill River for a distance of four miles. Skirting the picturesque Wissahickon Creek, which flows into the Schuylkill, is the famous Wissahickon Drive.

of rocks, some strata pure limestone and others clayey or argillaceous limestone.

These two kinds of rock are mixed in proper proportions and ground to impalpable powder. Huge crushing machines munch hungrily their diet of stone, day in and day out, passing their grist on down to giant grinders having maws filled with steel flails that fly around at high speed, propelled by a central shaft; and

A ROTARY CEMENT KILN

The powdered coal is introduced into the kiln through the pipe in the end. The glowing spot below is the opening through which, after having donned green goggles, one looks at the inferno within.

when they digest their quota of cement rock that substance looks like flour that has turned dark gray.

While the rock crushers and grinders are busy—whole batteries of them—the coal crushers and grinders are at work also, preparing coal dust as finely ground and impalpable as the rock dust.

THE ROTARY CEMENT KILN

Here another process begins, in which long rows of rotary kilns play an important rôle. Imagine a hollow pipe, lined with fire-brick, big enough for a horse to walk through, about 150 feet long, mounted on pivots and rotated by cog gears after the fashion of a great shaft. Into one end pours a constant stream of rock dust. Into the other, driven madly forward by compressed air, goes a like stream of coal dust, hissing and burning, as from an inferno. In the middle of the big kiln they meet.

The observer is supplied with a pair of colored glasses; the operator opens a tiny door and bids you look in. Glowing with a whiteness that rivals the electric arc, you see the materials apparently in the process of turning from solid to liquid; but, just at the point of incipient fusion, droplets or nodules of a dark-gray color, ranging from the size of a small pea to that of a large hazelnut, are formed.

These nodules are carried out on an endless-bucket belt, glowing like embers on a hearthstone, to the cooling towers. Here they are cooled under forced drafts of cold air. Then they go to meet another set of grinders, to endure the beatings of another series of mechanical flails. Literally they are beaten to dust—and that dust is the Portland cement of commerce, to which the world's debt cannot be estimated with any yardstick at my command.

THE SCIENCE OF HANDLING DUST WITHOUT WASTE

The finished product is carried to large storage bins and then barreled or bagged.

Photograph by J. Horgan, Jr.

ONE OF A THOUSAND MONUMENTS TO THE COAL MINER; THESE MOUNTAINS OF REFUSE FORM A CONSPICUOUS PART OF THE LANDSCAPE OF THE ANTHRACITE AREA: NEAR SCRANTON

When it is realized that this great culm bank is only the tailings of the anthracite industry, and that wherever one goes, from Carbondale to Pottsville, and from Shickshinny and Shamokin to Mauch Chunk, replicas of it, large and small, may be seen, something of the immense demand the country has made on the hard-coal mines can be appreciated.

Photograph by A. E. Young

THIS STRING OF ORE VESSELS, MILES IN LENGTH, IS HELD FAST IN THE ICE ON LAKE ERIE

What could more eloquently picture the greedy appetites of Pennsylvania's blast furnaces than this involuntary congress of cargo carriers! When surveys showed that the southern boundary of New York did not reach the shores of Lake Erie, and Connecticut and Massachusetts set up claims for the little triangle that did not belong either to New York or Pennsylvania, the United States Government cut the Gordian knot by taking possession and selling it to Pennsylvania—thus preceding the Paris Peace Conference a century and a quarter in the consideration of "a corridor to the sea" (see page 403).

THOUSANDS OF TONS OF ORE STORED IN A JOHNSTOWN YARD

Nestling in a narrow valley on the western side of the Allegheny Mountains, Johnstown is a typical "steel town." In the doleful days of the Johns-

Photograph courtesy Philadelphia Commercial Museum

THE HOLD OF A LAKE STEAMER WHICH BRINGS THE ORE FROM THE MINES OF MINNESOTA TO THE STEEL INDUSTRY OF PENNLAND

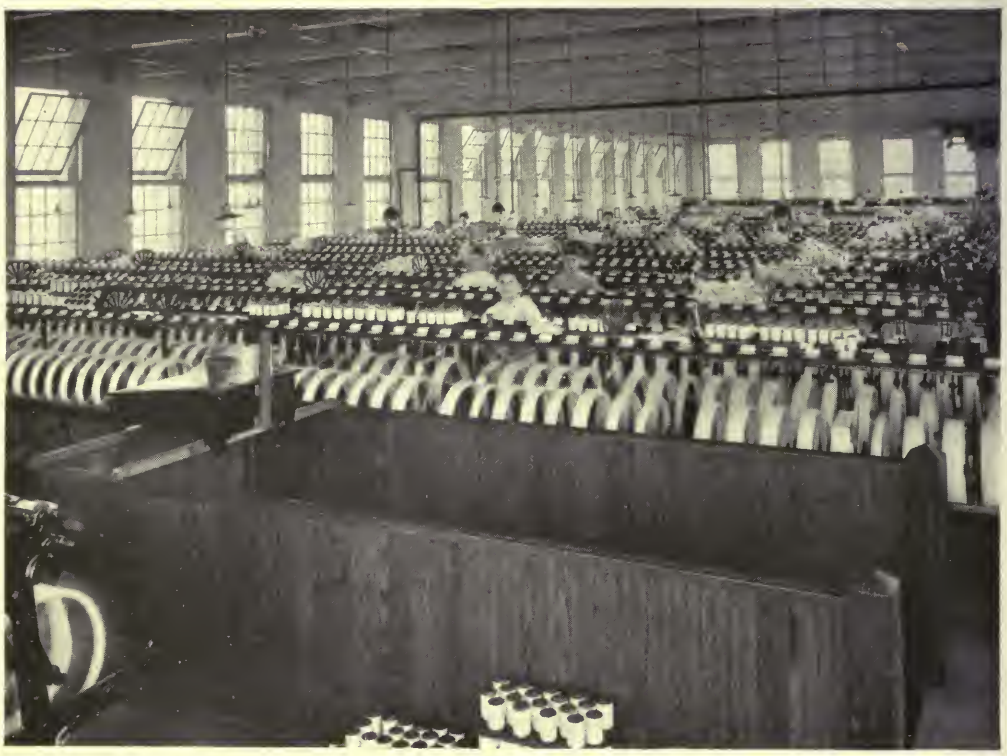
The huge buckets can scoop up two 4-horse wagon-loads of ore at a time.

In some plants the packing machinery is far from the least interesting part of the equipment. Leading from the bin is a large hopper with an automatic weighing machine. The barrel, with the head in place, but having a two or three-inch hole in the center, is put in position, a big funnel connecting the head-bung with the hopper. Through this the cement flows until both the barrel and the funnel are full.

The barrel is then lifted away by a machine and set on a mechanism that may be depended on to pack the cement tight. Overhead is a shaft made on the principle of that which drives the pistons of an automobile engine. As it turns around, it lifts the barrel several inches, and then lets it drop, repeating the process about as rapidly as one can count. When this shaking process is finished all of the cement has been driven out of the funnel and into the barrel, which is now packed as tightly as if it were solid rock. A piece of wood is nailed over the hole, and the steel-hooped barrel, weighing nearly four hundred pounds, is ready to be transported.

With three separate operations of converting hard solids of considerable size into dust, at the rate of thousands of barrels a day, one would naturally think of a cement plant as the dustiest place in all the world. Yet in many modern Portland cement plants there is not as much free dust floating around as one finds in the average old-fashioned country gristmill. Indeed, there are some plants so free from dust that one might go through them in a dress suit and come out without serious need of a whisk-broom or a clothes-brush.

The shearing strength of concrete made from Portland cement is rising to such unexpected heights that the experts suggest that the day may not be far distant when architectural specifications will permit the same lightness of construction that is accepted with steel. A world shortage of steel might be compensated



INTERIOR VIEW OF ONE OF THE LARGE SILK MILLS AT WILKES-BARRE

A pound of raw silk often contains enough unspun thread to reach 181 miles. To convert this into a pound of organzine, or warp threads, requires 264,000,000 turns of a spindle—10,000 a minute for two months' working time.

by an abundance of artificial stone as hard as any adamant made in the laboratory of Nature.

THE ROMANCE OF SILK

It is a long step from cement to silk, and yet, as showing the remarkable versatility of the industrial situation in the Keystone State, a step worth the taking here. There are several good reasons why Pennsylvania produces one-third of all the silk made in America. In the first place, silk manufacture is essentially a woman's industry. A woman can attend a loom as well as a man, or look after spindles, or supervise the quilling of thread.

Nowhere else can such an abundance of women workers be found as in the coal regions and the heavy manufacturing districts. Such industries are largely closed to women, and hence the wives and daughters of the miners and factory workers welcome employment in silk mills.

Then, again, the silk that milady wears may seem filmy and its sheen may be charming, but the process of manufacture demands a surprising amount of power. Especially is this true of the spinning, or "throwing," as it is technically known. Raw silk is too thin to be woven directly. The spun silk that constitutes the warp, or threads that run lengthwise of the goods, is known as organzine.

THE POWER REQUIRED IN MAKING SILK

A pound of good quality raw silk will yield enough unspun thread to reach from Philadelphia to New York and return—181 miles; yet in making organzine, or warp thread, every inch of that must be twisted some sixteen turns, after which it is doubled and twisted about fourteen

WINDING SILK ON QUILLS IN A MODERN MILL

The hundreds of spools of white silk thread shown at the top of the picture have been wound by the machine which the operator is tending. These spools, or quills, are now ready for the shuttle and the loom (see illustration on page 390). The American silk industry employs more than a hundred thousand operatives in converting annually 25,000,000 pounds of raw silk into a finished product.

turns in the reverse direction, the exact number of turns depending upon the use to be made of the thread.

The two twistings are equal to twenty-three turns for every inch of the original thread, so that the revolutions of a spindle required to convert a single pound of raw silk into a pound of organzine reaches the enormous total of 264,000,000. In other words, if the conversion had to be made by a single spindle, it would have to do ten thousand turns a minute, fifty-five hours a week, for eight weeks or lose its union card!

What happens in the case of the warp threads takes place in less degree in the woof threads—the ones that run across the goods—which are known as tram, and have only a single spinning.

After such facts as these, any one can readily see that a great deal of power is needed in the making of even such delicate material as silk. They explain why such a large percentage of the silk woven in America is prepared for the weaver in the coal region around Wilkes-Barre, Hazleton, and Scranton. Cheap fuel means cheap power, and cheap power makes silk throwing profitable.

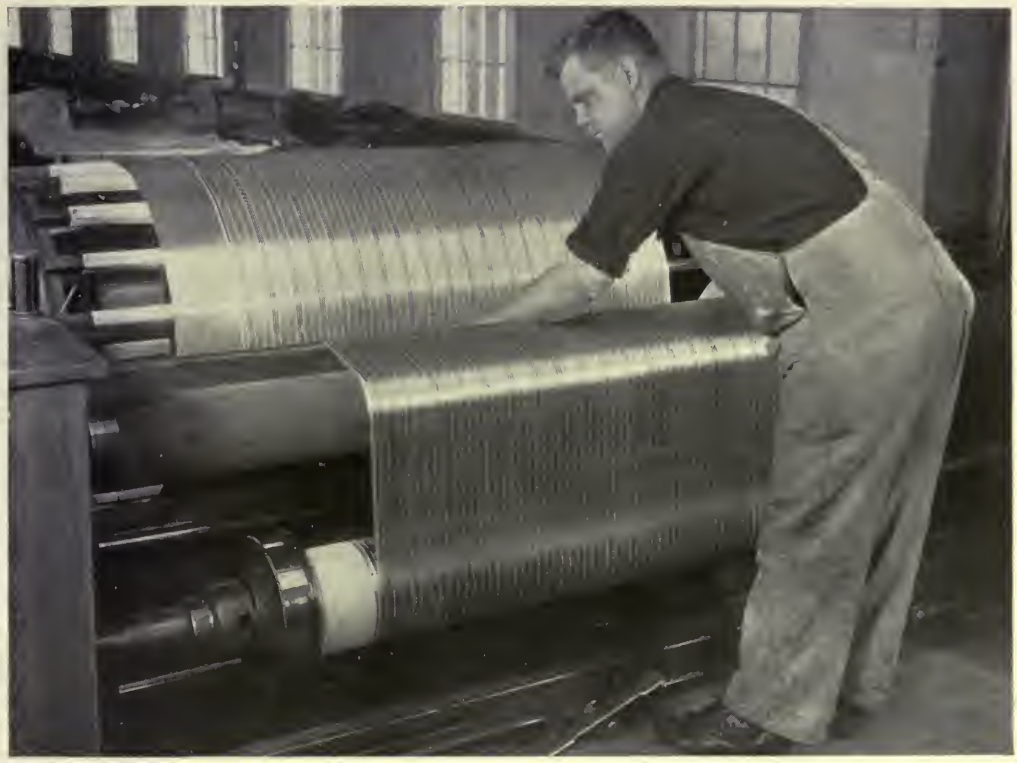
The throwing and dyeing are usually done for the weavers on a commission basis. The raw silk, as it comes from Japan, China, or Italy, is first steamed and degummed. This gum takes away about one-fifth of its weight. After this come the dyeing and throwing, and usually the weighting.

WOMEN ARMORED WITH TIN

The weighting process is very interesting, both from the standpoint of manufacture and wearing. In silk that may have cost eight or ten dollars a pound, the extraction of the gum represents a

WEAVING SILK ON A MODERN LOOM

The girl in the picture is holding up for inspection the shuttle which passes back and forth as the warp threads are separated to make proper paths for it—above one thread, below the next, etc., the number and order of the threads depressed and elevated depending on the character of the goods being woven.



BEAMING, OR PREPARING THE WARP FOR THE LOOM IN SILK WEAVING

This is composed of the threads that run lengthwise of the goods. It is put on the loom where the shuttles carry the woof threads back and forth and complete the weaving process.

serious shrinkage. It happens that silk has a particular affinity for tin dissolved in hydrochloric acid. So the silk manufacturer proceeds to treat his degummed silk to a bath of liquid tin. It absorbs several ounces to the pound of silk. Then he washes it in a phosphate-of-soda preparation which increases its power of absorbing tin, and gives it another bath. He may repeat the process until his pound of raw silk, which had shrunk to thirteen ounces by the degumming operation, takes on enough tin to make it weigh at least twenty and perhaps forty or even sixty ounces.

This weighting is of advantage to the wearers. An ordinary 19-inch taffeta, that retails at, say, $1.50 a yard, is composed, probably, of five-eighths silk and three-eighths tin. Yet it is satisfactory in its luster and will ordinarily wear for two seasons, which is alleged to be the longest any woman would want a silk dress or waist to last. If that taffeta were made from untinned silk it would cost $2.20 a yard and serve milady no better.

During the last year or two, under the stress of raw silk prices of unprecedented heights, weighting came to be done in the woven goods as well as in the tram and organzine, so that the women of the country often wear as much tin as silk, and frequently more.

CIVILIZATION'S PROGRESS MEASURED IN GLASS

To say that civilization's advancement is based on glass seems a gross exaggeration at first blush; and yet, when one reflects how many sciences and how much human knowledge came to the race through that commodity, the accuracy of the statement is apparent. The science of preventive medicine was born of the microscope. But for the telescope and the spectroscope the world would know about as much of astronomy as was known by the shepherds on the plains of Persia. One may read the whole list of technological industries without discovering lines of

GLASS-BLOWING AT A PENNSYLVANIA PLANT

In this picture are shown most of the operations of blowing glass by hand methods. The first man on the left of the picture is the "blower." The glass has been gathered on the end of the blowpipe for him and he is shaping it. The next workman is cooling the shaped ball. More glass is then gathered on the ball and the third workman is enlarging it. The fourth workman is the final blower. Standing on the "blower's block," he blows the glass until it assumes the shape of the mold inside the block. The making of window glass by hand methods is a variation of the process shown (see text, page 395).

endeavor where glass does not play an essential rôle.

It was Pennsylvania that fostered the manufacture of this commodity in America, and it is from Pennsylvania today that the American people get a third of their supply.

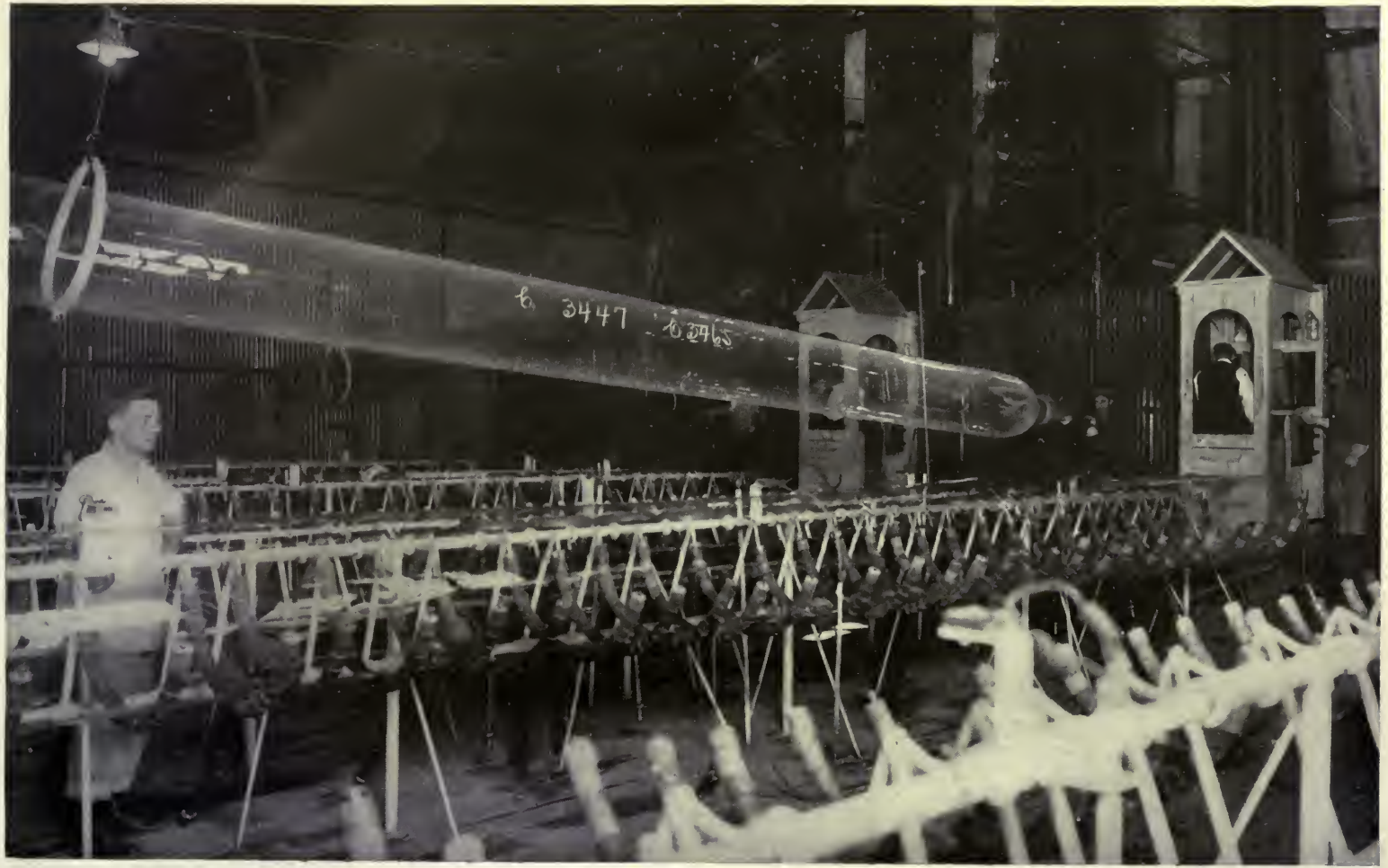
The processes of manufacturing glass are extremely interesting. To see sand, soda, and lime mixed, subjected to heat, and turned into glass as transparent as the clearest water, or even as the very air itself, shows what liberties man has learned to take with Nature. Now as free-flowing as water, now as sticky as warm taffy, now as hard as flint, it lends itself to the manipulation of human hands and the purposes of man with astonishing versatility.

The mixed materials, technically known as the "batch," consist of white sand and such bases as potash, soda, lime, and lead. Small quantities of other materials are added as auxiliaries to change the color or nature of the glass. Manganese and arsenic are among the agents employed to make it colorless. For window glass a batch may be made up of 8,000 parts sand, 2,200 of soda sulphate, 2,500 of lime, 50 of arsenic, and 40 of powdered coal; or the amount of lime may be cut down and carbonate of soda substituted.

Window glass is of two kinds—cast and blown. The cast is the plate-glass of commerce. In making it the process is not dissimilar to the rolling of dough on a dough-board. A huge flat table with a rim around the edge is filled with a pile

A MACHINE-BLOWN CYLINDER OF WINDOW GLASS BEING LOWERED INTO ITS CRADLE

Pennsylvania leads the United States in the production of glass in its various forms, and the great industrial city of Pittsburgh has been the scene of most of the developments in process and labor-saving machinery which have revolutionized this industry in the past two decades. The cylinder is hollow.



A MACHINE-BLOWN WINDOW-GLASS CYLINDER BEFORE THE ENDS HAVE BEEN REMOVED

In its present form it resembles a giant test-tube. After it has been lowered into its supporting cradle the ends will be removed by cracking the cylinder smoothly, this being accomplished by wrapping hot glass threads around the glass and then touching the surface with a cold iron (see page 395).

Photograph courtesy Philadelphia Commercial Museum

REMOVING THE WASTE ENDS OF CYLINDERS, ONE OF THE OPERATIONS IN THE MANUFACTURE OF WINDOW GLASS

A cylinder of glass having been blown to the proper thickness and length, both ends are snapped off. A hot iron or electric wire is then passed along one side from end to end. The application of a cold iron to this heated streak causes the glass to crack, after which the cylinder is ready to be softened by heat and flattened into sheet glass.

of hot, putty-thick glass. A big mechanical rolling pin spreads it out, after which it hardens. Then it is sent to the annealing furnace, heated, and allowed to cool gradually, for cooling either too fast or too slow would be ruinous. Finally it is ground down and polished and is ready for shipment.

FROM SOUP TO WINDOW GLASS

The process of making blown window glass is entirely different. In hand-blowing, after the batch has been melted, the "gatherer" takes a pipe about five feet long, with a bell-shaped head at one end and a mouthpiece at the other, and dips the bell-shaped end into the molten glass. A small ball of the glass adheres. He blows through the pipe and transforms this ball into a thick-skinned bubble. When this cools sufficiently it is dipped into the molten glass again, and more adheres. The process is usually repeated five times, the bubble growing thicker of skin each successive time (see page 392).

The pipe, with its adhering plastic bubble, is then given to a "snapper," or helper, who carries it to the "blower's block," where the "blower" takes it. The latter workman is the king bee of the glass industry—big of body, powerful of lung, and deft of hand. He places the bubble in the "block," which is an iron mold set in water to prevent its becoming too hot, and lined with charcoal to keep the iron from discoloring the glass.

By turning the bubble in the block, blowing air into it as he does so, and gradually drawing the pipe upward, he slowly transforms it into a pear-shaped affair. The lower part gradually becomes solid and too hard to be workable even with his powerful lungs. The snapper puts it into the blow furnace, and

Photograph courtesy Philadelphia Commercial Museum

WINDOW GLASS IN UNCUT CYLINDERS STORED FOR FLATTENING

When window glass has been blown and the defective ends cut off, it has the shape of glass tubing about as tall as a man and with a diameter of about twenty inches. How this tubing is split and made flat is explained in the text on page 397.

when it is properly heated he gives it back to the blower. Standing over the "swing hole," the blower allows the weight of the plastic glass to elongate the pear into a cylinder, which he gives the desired diameter by blowing into it intermittently.

But, although it has reached the desired diameter, the cylinder is not yet long enough to suit his purpose. So he reheats it and blows it over and over again until it attains the prescribed length.

At this stage the cylinder is completed, but the free end is closed and the other end still adheres to the blowpipe. It is put back into the blow furnace and the free end heated until it is soft enough to permit the blowing of a hole through it. The resulting imperfect end is cut away by wrapping a hot glass thread around the cylinder above the imperfection, at the point of severance. Touched with a piece of cold iron, the imperfect section breaks asunder. The cylinder is freed from the blowpipe in a similar manner.

We now have a perfect hollow cylinder of regulation window glass. But before it can be used in a window it must be flattened. To accomplish this it must first be split open. A hot iron or a charged electric wire, passed up and down the line of cleavage, plays the rôle of a pair of shears. It causes a strain-line to form from one end of the cylinder to the other, and when this is touched with a piece of cold iron the big roll breaks open as perfectly as though it were cut open with a diamond cutter and straight-edge.

After this the roll of glass is sent to the annealing furnace. Heated to a proper degree, the glass becomes soft enough to permit the roll to be flattened. It is then carefully cooled and stored, ready for market.

MECHANICAL GENIUS A REVOLUTIONIZER

By the hand-blowing process cylinders up to as much as six feet long and nineteen inches in diameter can be blown. Machine blowers have been gradually substituted and have revolutionized the art of making flat glass. All the larger cylinders, such as are illustrated on pages 393 and 394, are machine blown.

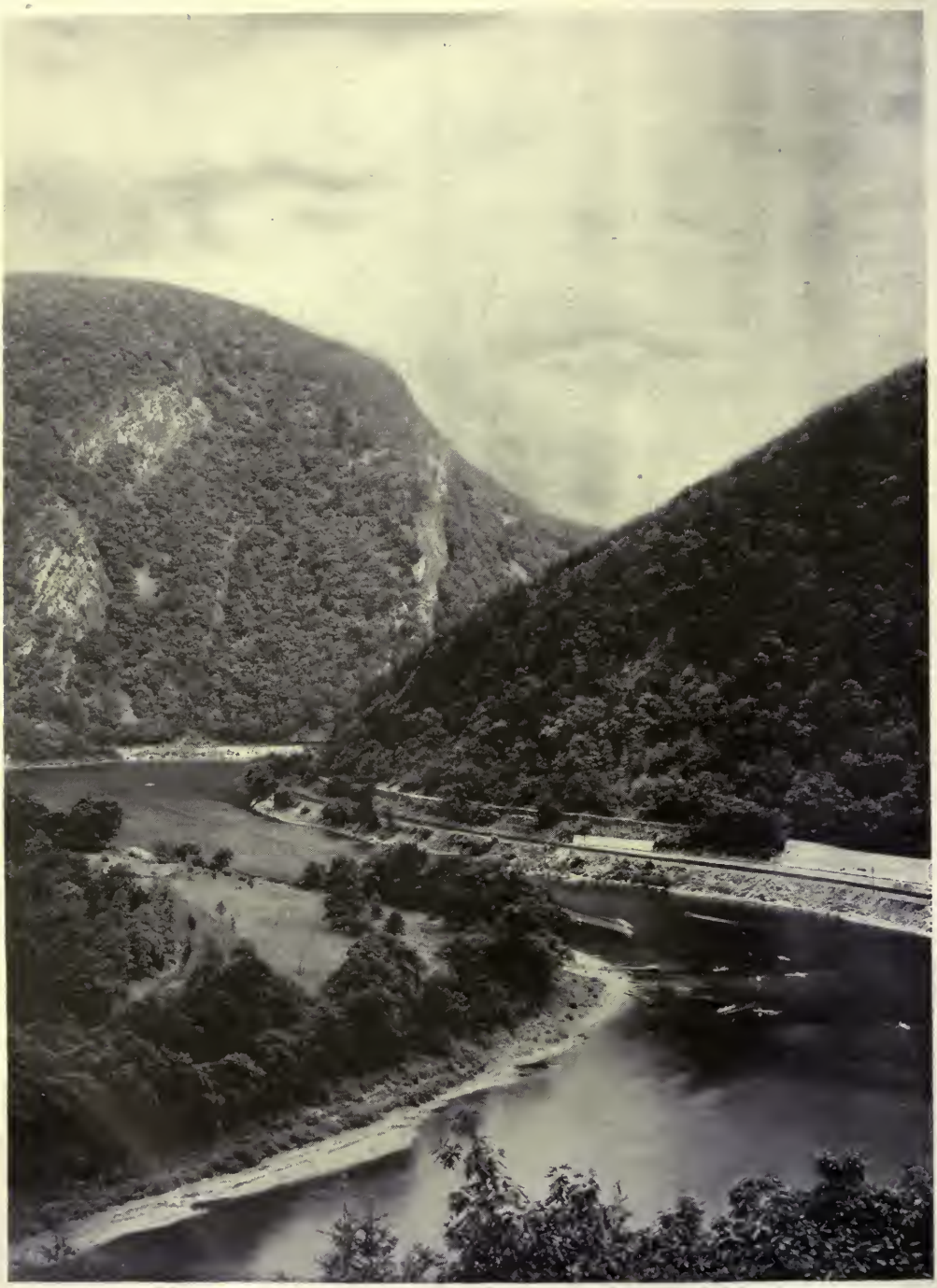
In simple terms a machine blower is an apparatus which automatically dips a big pipe into a kettle of molten glass, and then gradually raises it, pulling all the molten glass upward as the pipe rises. A constant stream of air kept flowing in through the pipe causes the glass to assume the form of a cylinder. Dip a soda straw into a thimbleful of molasses, and blow through the straw as you lift it up from the molasses—that process would roughly duplicate the principle of the mechanical glass blower.

It would be too long a story to tell in this article the processes of making all kinds of glass; but it may be said that when the machine for blowing bottles came into use it changed the bottle industry as much as the mechanical blower changed the window-glass industry. Machines have been invented for blowing electric lamp bulbs also, but the hand blowers are still able to produce a major portion of these.

When America went to war, there was a dearth of optical glass in the country. Germany had a monopoly thereon; but Pennsylvania glass experts and the United States Bureau of Standards set to work on the problem, and today this State is making as good optical glass as is to be found anywhere. Hereafter America will see the world through its own spectacles and not through glass that comes from overseas.

One of the demands of the war was for one-way glass,—glass that is transparent from one side and opaque from the other—being required for range-finders and other optical instruments. It is made by silvering one side, so that it transmits exactly the same amount of light that it reflects. There is a possibility that such glass will ultimately be used in architecture. With it the manager of a big business could have an office where he could work in privacy and yet always be able to see what was going on in the outer offices.

One of the largest groups of factories in America is that which comprises the companies classified under the general head: Westinghouse industries. One of these mammoth plants fabricates the air-brake, to which the world owes a great debt. It has equipped some three million



THE TORTUOUS TURNINGS OF DELAWARE WATER GAP

Wherever a Pennsylvania river breaks through a mountain barrier, there is a railroad to hug its banks. The streams are nature's engineers in constructing passages through the mountains, and man is quick to adapt such rights-of-way to his needs.

cars and perhaps a hundred thousand locomotives with this life-protecting boon. Another of the Westinghouse group makes the switch and signal equipment now in use on roadbed mileage sufficient to establish a ten-track line entirely around the earth. Still another is the giant electric machine company that creates everything electrical, from a sad-iron to a dynamo of ten thousand horsepower.

A STATE OVERFLOWING WITH CITIES

No State in the American Union possesses so many thriving urban communities as Pennsylvania. With Philadelphia not far removed from the two-million mark in population, and Pittsburgh driving upward to the three-quarters of a million, both the east and west sections of the Commonwealth are possessors of industrial communities of first rank in the Western World. But as these two cities will later be the subjects of articles to appear in the "Cities of the Nation" series in THE GEOGRAPHIC (see "New York—Metropolis of Mankind," in the July, 1918, number, and "Chicago Today and Tomorrow," in the January, 1919, number), further reference will not be made to them here.

In addition to these, the State has two other cities that have passed the hundred thousand line, three that are in the seventy-thousand class, and two in the sixty-thousand class. It also has three with fifty-odd thousand people, the same number with forty-odd thousand, and a like number with thirty-odd thousand. Fourteen cities have passed their teens and have not reached their thirties, and thirty or more have outgrown four figures, but have not yet passed out of their teens.

SCRANTON, A HIVE OF INDUSTRY

Starting down the list after the Quaker City and the Smoky City, one comes to Scranton, situated in the heart of the anthracite region, in Lackawanna County.

Imagine buying power on the basis of two dollars a ton for buckwheat anthracite delivered at your furnace-room door. Fancy twenty million tons of black diamonds coming up out of the earth in one community every twelve months. Picture a people so progressive that they raise a community fund of a million dollars to be used in aiding responsible industries to expand. That's Scranton, and why it is growing at such a rapid rate.

One factory turns out three million buttons a day. One-third of the nation's raw silk is carded and spooled in its metropolitan district. More than half a million people live within twenty miles of its court-house. Bees in a hive in the springtime were never busier than the hustling, bustling, go-ahead folk of the Electric City.

Almost at Scranton's very doors are the famous Pocono Hills, the Delaware Water Gap, and the lakes of southern New York. A city of homes, public health is almost an obsession with its people, and a death rate of only thirteen per thousand is the result.

A CITY OF HOSIERY AND HARDWARE

Next in order of size comes Reading, the nation's second city in the production of hosiery and builders' hardware. With the anthracite region at its back door and the splendid farming communities of southeastern Pennsylvania to the right and the left and in front of it, the city is keeping pace with its larger neighbors in a way out of proportion to its size. It has more than five hundred manufacturing plants, which make commodities ranging from adding machines and railroad engines to spectacles and art glass. For the diversity of its manufactures, the prosperity of its people, the advantages of its location, and the promise of its future, Reading is an urban community that justifies the pride of its citizens.

Wilkes-Barre, built upon the beautiful banks of the Susquehanna, calls itself the "Diamond City." More than three hundred thousand people live within a radius of ten miles of its central square. The production of anthracite coal in Luzerne County, of which it is the court-house town, is worth more than the gold production of the United States, Alaska included. In the beauty of its buildings, the character of its citizenry, the extent of its civic development, the strength of its financial resources, and the progressiveness of its policies, the city can stand comparison with any urban community of like size anywhere.

Photograph by Deck Lane

FATHER, GRANDFATHER, AND GREAT-GRANDFATHER HANDLING THE HAY THAT THE AMBITIOUS MEMBER OF THE FOURTH GENERATION RAKES

There is no race suicide in rural Pennsylvania. Early marriages often give four generations to one harvest field and sometimes five to a single roof-tree. The Pennsylvania farmer's heart is as true as his hands are hard.

STARTING ON THE ROAD TO GOOD CITIZENSHIP

Pennsylvania's staunchest admirers confess that the State's elementary educational system is far from ideal, with eleven thousand of its teachers receiving salaries of less than $500 a year. The best interests of the future citizens of the Commonwealth are served only when their educators are thoroughly trained and adequately paid.

Photograph courtesy Philadelphia Commercial Museum

STALKING STEAM TO ITS SOURCE

Burrowing away in the world of eternal night beneath the surface, the miners are the men behind the wheels of almost every Pennsylvanian industry. No other similar area in the world gives employment to as many miners as the coal lands of Pennsylvania.

Nowhere else in the world can fuel for power purposes be bought more cheaply than at Wilkes-Barre. Black diamonds in unbelievable quantities lie, ready to be mined, directly beneath the city's factories; and hundreds of millions of dollars are invested in the long list of industries that seek cheap power and make good profits here.

Who that has traveled from Mauch Chunk to Wilkes-Barre on the Black Diamond or the Scranton Flyer has not admired the day scenery on the one or the night scenery on the other? Two railroads hug the Lehigh River from Mauch Chunk to White Haven, through as wild a mountain region as can be found east of the Rockies. From there they reach the top of Nescopeck Mountain above Penobscot by diverse routes. Behind the traveler lies a branch of the Lehigh Valley, with its rugged scenery, and in front of him is the wonderful Wyoming Valley, with collieries as thick as hops, and Wilkes-Barre a quarter of a mile beneath him.

And at night, as the summit of the mountain is passed and myriads of lights, bright and dim, yellow and white and blue, flash up from Wilkes-Barre and its dozens of adjacent towns in the valley far below, the traveler passing that way for the first time well may wonder whether the heavens have of a sudden been inverted, or whether a great silver lake beneath him is reflecting thousands of stars.

HOW ERIE BECAME A PART OF PENNSYLVANIA

The story of how Erie became a part of Pennsylvania might have served as a tip to the Peace Conference on corridors to the sea. New York's charter defined its western boundary as the meridian line extending southward to the forty-second parallel of latitude from the western extremity of Lake Ontario. It was always assumed that the Pennsylvania-New York line would extend directly into Lake Erie, and that therefore the Erie site and Presque Isle belonged to New York. But the actual survey revealed the fact that there was a small triangle that did not belong to either State.

Thereupon Massachusetts and Connecticut both claimed it, on the ground that the charter of the Plymouth Company gave them all the land lying in their latitude as far west as the Pacific Ocean, not previously settled by other Christian powers. After protracted negotiations, New York, Massachusetts, and Connecticut released their claims in favor of the Federal Government, which, in turn, sold the land to the State of Pennsylvania, giving her a harbor on the Great Lakes. However, Connecticut, in consideration of her release, reserved a tract in northeastern Ohio. Hence, the Western Reserve of the Buckeye State.

Situated between the coal of Pennsylvania and the ore of Minnesota, possessed of one of the finest harbors on the Great Lakes, Erie is host to some five hundred manufacturing establishments. It has the largest horseshoe factory and the largest pipe-organ plant in the world, and makes more baby carriages, gas mantles, and clothes-wringers than any other city.

It is one of the few industrial cities of America that is resolved not to neglect the esthetic side of its development. In pursuance of that purpose, it borrowed a chapter from the history of Chicago and created a city planning commission which has laid out a goal for Erie to grow up to.

CITIES WHICH BOAST SUPERLATIVE INDUSTRIES

Each of the State's lesser centers of population possesses some industry in which its citizens experience justifiable pride. Harrisburg, in addition to enjoying the distinction of being the Commonwealth capital, is one of the principal railroad centers of the East, while one of its suburbs indicates in its name, Steelton, the nature of its industrial interests. Johnstown, likewise, is an iron and steel center.

If quantity and quality of the manufactured product signify, Allentown is the world's cement capital, for two-fifths of America's output is produced within a radius of 20 miles of this beautiful city of homes, which is also noted for its silks.

Walk from one end of its main street to the other in the summer-time and every lamp-post you see supports a basket of flowers. Think of a bouquet-studded

street several miles long. In the winter evergreens take the place of the blossoms in the baskets. The effect is charming. But it is characteristic of Allentown and the spirit of Pennsylvania.

The importance of Altoona's railroad shops is indicated in the fact that nearly half as many people found employment in them before the war as were required to man the Federal Government machine in Washington.

Lancaster's claim to fame is expressed in three superlatives: the largest linoleum factory, the largest umbrella factory, and the largest silk mill in the world. In addition, its output of books and magazines devoted to science is extraordinary, and its stockyards are the most extensive east of Chicago. One of the finest watch factories in the world is located here, and, although its industries give employment to 23,000 operatives, the city has never had a strike.

York prides itself on the diversity of its industries rather than upon the magnitude of any one, and in this particular it takes rank after Philadelphia and Pittsburgh. McKeesport's pride in the largest tin-plate plant in the world is justified, while Newcastle produces more tin in sheets and blocks than any other city; Chester is a veritable Vulcan-shop, with ships sliding from the ways, locomotives rumbling from its shops, and shells coming by the carload, in war time, from its munitions plants.

And so the story goes, from Pennsylvania city to Pennsylvania city. Where the ambition of one turns in the direction of silk, or tin, or heavy forgings, another is the center of a rich agricultural district, or finds gratification in the fact that it is distinguished for safeguarding and improving its people's health. Take a map of the State, and every dot representing a community of 10,000 or more inhabitants would furnish a text for an article on civic progress or industrial enterprise.

Outside of Philadelphia, Pennsylvania is much more populous than is New York outside of New York City. Indeed, Pennsylvania goes down to Philadelphia with 6,325,000 population, while New York goes down to the Bronx with 4,723,000.

It is the large number of cities of less than thirty thousand population that makes Pennsylvania, outside its chief city, such a populous State.

A MONUMENT TO RELIGIOUS FREEDOM

No bit of literature compiled regarding Pennsylvania could fairly represent that State without at least a passing reference to the religious sects which were transplanted there in colonial times and which flourish to this day in nearly their primitive simplicity.

When William Penn founded his colony, the central purpose of his life was to establish an asylum where the persecuted of all lands could come and worship God according to their own consciences and live according to their own religious convictions.

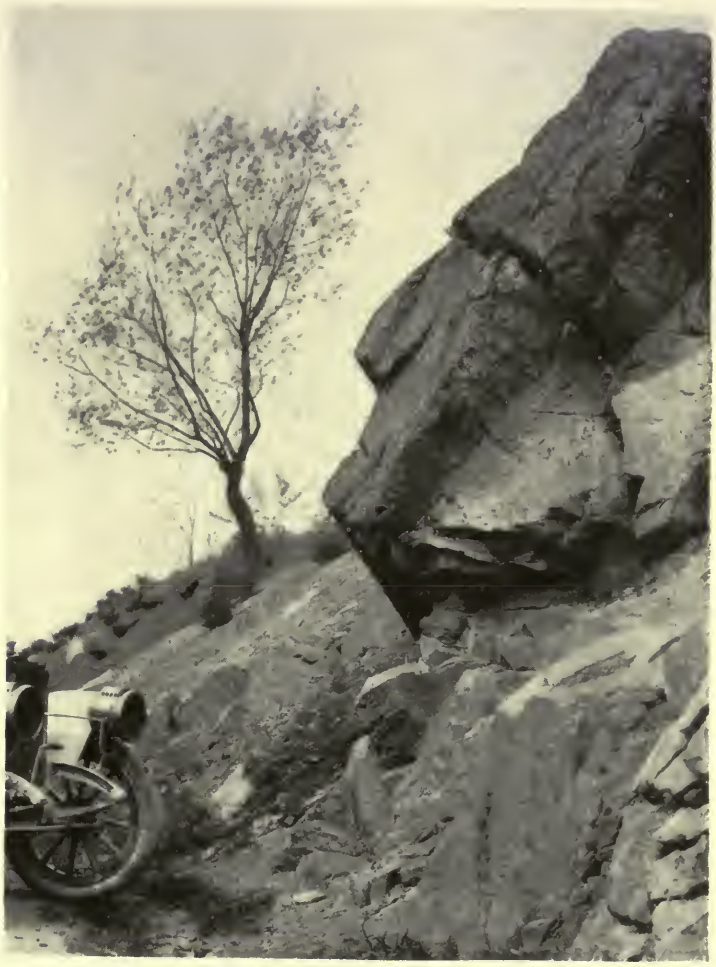
The Quakers came by the thousands. Their meeting-houses sprang up everywhere. Not content to express their religion in their walk and conduct, they gave it expression in their dress and in their very words. The broad-brimmed hat and the Quaker bonnet were seen and the "thee" and "thou" were heard everywhere. The lives the Quakers lived won the admiration of all who came into contact with them, and much of the solid development of the State is due to the high standard of integrity and fairness established and maintained by these people of Quaker faith.

Mennonites from Holland and Switzerland and the Rhine Country, persecuted by nearly all creeds alike, came in large numbers and developed into the successful agriculturists of the three original counties. The Dunkers of Switzerland came as a body, root and branch. The Schwenkfelders of Silesia, distressed by persecutions that were without pity, braved the perils of raging seas and untamed forests in order to find a haven where they could live in their faith. The Moravians followed later, to share with the other sects the blessings of tolerance in the land of Penn.

Humble, unsung, content to play their quiet rôles without the applause of men, like the bee that renders an unconscious service to the flower, these sects have wrought richly in the making of the nation.

It seems like going back into an earlier century to visit the cloisters of Ephrata and Nazareth; it appears passing strange to see the Amish Mennonite, with his tailless coat and broad-brimmed hat, on the streets of progressive Lancaster; it surprises the visitor to Allentown to hear well-dressed, up-to-date people, from court officer to manufacturer, talking Pennsylvania Dutch!

Yet millions of America's best farmers inherited their command of the soil from such ancestry; from such simple folk have sprung scores of governors of States, many jurists, a galaxy of educators, etc. The Pennsylvania pietist, in his ascetic way, has done his bit in making his State what it is—and his part in shaping the bone and sinew of the nation.



Photograph by G. A. Conradi

WASHINGTON PROFILE ROCK, SAYRE PARK, LEHIGH UNIVERSITY: SOUTH BETHLEHEM

Her magnificent highways and the eye-filling scenery of such regions as the Delaware Water Gap have an irresistible lure for the pleasure-seeking autoist.

THE STATE'S SHARE IN MAKING AND PRESERVING THE UNION

As for its history, whether in the remoter period of colonial times or in the just-passing era of America's activities in the world war; whether in the battle for the establishment of the Union or the struggle for its maintenance, the Keystone State has always played a rôle second to no other Commonwealth. It was on Pennsylvania soil that the Declaration of Independence was written; that the disheartened colonists were reorganized for victory at Valley Forge, and upon which the Constitution of the United States was proclaimed.

It was from Pennsylvania that the men came who shed the first blood in the Civil War, and at Gettysburg the tide against disunion was turned, under the leadership of a Pennsylvania soldier.

When America threw the weight of its power into the balance in the Armageddon of liberty in Europe, Pennsylvania was in the van of those ready for action.

No other division in France, outside of the Regular Army forces, was earlier in the fray than the Twenty-eighth, made up largely of Keystone troops. With

Photograph by William H. Rau

ALONG THE SUSQUEHANNA RIVER NEAR COLUMBIA, PENNSYLVANIA

Railroad, canal, and river here sweep in splendid curves around the lofty rocks that make the valley little more than a gorge.

casualties of 14,417 in the 177 days between arrival at A. E. F. headquarters and the armistice, the division made a record not surpassed in the war. For 49 days it was in the very thick of the hardest fighting of the conflict.

The State gave 298,000 men for the Army, 29,000 for the Navy, and 3,000 for the Marine Corps—a grand total of 330,000 men, to say nothing of the hundreds of thousands of workers in shipyards, munition plants, etc., who answered their country's call.

Of course, Pennsylvanians are proud of their State's rôle in the nation's activities. And the coming of peace will find them at the forefront of those who shall provide the world with the munitions of peace—engines and cars, coal and steel, a thousand commodities, in the making of which Pennsylvania serves doubly—herself and the whole world.

HUNTING BIG GAME OF OTHER DAYS

A Boating Expedition in Search of Fossils in Alberta, Canada

By Barnum Brown

Associate Curator of Vertebrate Paleontology in the American Museum of Natural History

With Photographs from the American Museum of Natural History

SINCE the days of our jungle forebears the quest of big game has appealed to man, his appreciation of the sport being measured chiefly by the size of the game and the difficulty of securing it.

Today we must go to Africa for the biggest game; but there was a time in the dim distant past when America produced animals larger than any now living. That was so long ago that nothing remains of these creatures except their bones, and they are turned to stone. Hidden away under strata of earth, their spoor has long since grown cold, and the hunt I shall describe is in consequence difficult.

The animals are dinosaurs; for the moment we will call them lizards—not the creeping, crawling kind, but huge reptiles that stalked upright through the jungles, rivaling in size the elephant, the hippopotamus, and the rhinoceros.

The place is Alberta, Canada, and the time of their existence 3,000,000 years ago.

Between the Great Lakes and the Rocky Mountains, just north of the Canadian boundary, lies a vast area of level land, prairie in the east and forested near the mountains, with a narrow intervening section that is brush-covered. East of the timbered belt the central part of Alberta is level as far as the eye can see and dotted here and there by small glacial lakes, where nest countless numbers of ducks and geese (see map, page 425).

THE CANADIAN FARMER'S ELDORADO

Fifteen years ago this level section was prairie land covered with a luxuriant growth of grass, on which grazed comparatively few cattle, with a ranch building here and there, but sparsely settled withal. Today the country is covered by a network of railroads, and near the railroads most of the available land is homesteaded.

The soil is very rich and of considerable depth, producing under favorable conditions enormous yields of small grain, yet only a fraction of the country is under cultivation. When fully producing, the future wealth of this great territory cannot even be estimated; it is the Canadian farmer's Eldorado.

A number of small rivers drain this area, uniting in the province of Alberta to form the Saskatchewan, which flows into Lake Winnipeg. The Red Deer River is one of these tributaries that rises in the mountains north of Banff. Numbers of lesser streams fed by mountain snows and prairie lakes join it, making an irresistible stream that has cut through the prairie land, forming a miniature grand canyon, a mile wide at the top and from two to five hundred feet deep.

ONCE THE BED OF A GREAT INLAND SEA

Although black, fertile soil forms the surface of the country, the earth below is composed of horizontal layers of clay and sandstone, and a journey of 250 miles down the river reveals four distinct geologic periods in the canyon walls. The strata representing these periods overlap like shingles on a roof, and in each are preserved the fossil remains of animals and plants which enable us to picture former conditions and life during past ages (see picture, page 413).

In the lower reaches of the river, 200 miles from the mountains, only sea-shells are found in the rocks, indicating that the

After Osborn, from a drawing by Charles R. Knight

BIG GAME OF OTHER DAYS (SEE PAGE 411)

These singular dinosaurs were semi-aquatic in their habits and had large, duck-like heads. They were rather delicately made, in spite of their great size, and were quite inoffensive. Several specimens have been found showing the impression of the skin in a perfect state.

From a drawing by Charles R. Knight

A COMMON SIGHT IN NORTH AMERICA MILLIONS OF YEARS AGO

The most extraordinary feature of this animal was the row of thin plates on either side of the median line, and also the long and heavily armed tail.

ocean—an inland sea extending from the Gulf of Mexico northward to the Arctic Ocean—covered this area during a long time, in which several hundred feet of strata accumulated.

Where these rocks flank the mountains they are tilted at an angle of several degrees, which shows that they were laid down before the complete elevation of the Rocky Mountains. This formation is called the *Pierre*. (Geologic formations are usually named from the "type" locality in which first recognized, and wherever rocks of the same age appear they are designated by that name.)

Near the close of the *Pierre* a part of the inland sea-floor was elevated above the ocean and became a land-mass of low altitude—a vast stretch of jungle-covered delta and coastal swamp, interspersed with bayous and lagoons.

In the fresh and partly salt or brackish water lake and river beds of this period are preserved leaf impressions of a variety of trees, rarely teeth and fragmentary bones of mammals, and numerous remains of a great variety of reptiles (see page 416). This is known as the *Judith (Belly) River* formation.

Subsequently this area again sank below the sea for a long time and 400 feet of deposits accumulated, in which only sea-shells and marine reptiles are to be found. This ocean deposit, also a part of the *Pierre*, is designated *Bearpaw*.

Then a long period of elevation began, the rocks and fossils showing a gradual change from salt to brackish water conditions, which near the top became quite fresh. These beds, over 700 feet thick, are known as the *Edmonton* formation. Presumably the area was near sea-level and subject to frequent invasions of the sea—a condition that may be better understood by comparison with the present everglades of Florida (see page 412).

THE HOME OF A HOST OF REPTILES

In these marshes of prehistoric times dwelt a host of reptiles, some large, some small, and of various forms, flesh-eaters and herb-eaters, but all sharing certain characters in common and known as dinosaurs. Not any were closely re-

A SPORTSMAN'S PARADISE WHEN THE QUARRY IS BIG GAME OF OTHER DAYS

For miles along the Red Deer River there is no sign of human habitation, but above on the prairie every quarter section of land forms a homestead. The dark objects on the horizon are haystacks. The cliffs of the river are filled with remains of primitive dinosaurs, turtles, and crocodiles.

THE BIG GAME HUNTERS' MOVING CAMP

The big flat-boat drifts downstream with the current. It is steered from the stern, and by concerted action of both oars can be pushed broadside to avoid rocks. The mosquitoes are often so thick that no one can work without a net over the face and gloves on the hands.

lated to any living reptile, yet they had some characters common to the lizards, crocodiles, and birds.

Of the kinds characteristic of the period one species, an herb-eater named *Trachodon,* was more than 30 feet long and about 15 feet high when standing erect (see page 408). Its head, with broadly expanded mouth, resembles that of a duck, but back of the beak there are more than two thousand small teeth, disposed in many vertical rows, each containing several individual teeth, the new ones coming up from below as the old ones wore out.

The long hind legs terminated in three large hoofed toes, and the shorter, slender front feet were partly webbed. A long, thin, slender tail acted as a powerful swimming organ, and the body was covered with rough tuberculate skin. Having no means of defense, it lived chiefly in the water, where it was free from attacks of the flesh-eaters.

With the "duck-billed" *Trachodon* there were other large closely related forms inhabiting the water. *Saurolophus* was similar in build, but characterized by a large crest extending above the skull, and pelvic bones that were developed for attachment of powerful tail muscles. It was probably a distinctly aquatic type (see page 418).

A DINOSAUR WITH PNEUMATIC BONES

Along the shores lived *Ornithomimus,* bird mimic, as the name implies, one of the most remarkable of the dinosaurs. A skeleton found last year shows it to have been a toothless creature, the jaws sheathed like the beak of a bird.

The bones were light and pneumatic, like those of birds, but the skeleton closely resembles that of the flesh-eating dinosaurs. It was about 12 feet in length, with long, slender hind legs and shorter front legs. This was an agile creature, different from the typical flesh-eaters in feeding habits and doubtless a shore-living type that may have fed on crustaceans.

AN IMPORTANT PAGE OF GEOLOGIC HISTORY: MARKING THE CHANGE FROM PURELY MARINE TO CONTINENTAL CONDITIONS, NEAR THE MOUTH OF WILLOW CREEK

The man stands on ocean sediments of Pierre Age (see page 409), above which are the conformable brackish-water Edmonton beds that contain dinosaurs.

SCANNING THE CLIFFS FOR SLEEPING MONSTERS

In a single quarry along these cliffs bones representing several hundred individuals have been washed out of the bank.

On land there were hoofed quadrupedal herbivorous kinds, some, like *Monoclonius* (see page 426), having an immense skull, six feet in length, with three horns, a short one over each eye and a longer one above the nose. The jaws terminated in a sharp clipping beak, like that of a turtle, and further back in the mouth there were rows of double-rooted teeth. The back of the skull was developed into a broad shield, with scalloped border, extending over the neck. It was ancestral to the later *Triceratops*.

A CREATURE FULLY ENCASED IN ARMOR, INCLUDING VISORS TO SAFEGUARD HIS EYES

Strangest of all was the herbivorous *Ankylosaurus*, a stocky, short-legged, big-bodied creature, completely encased in armor. Dermal plates covered the skull, followed by rings of plates over the neck and rows of flat plates over the back and hips. Its tail terminated in a huge club, and the belly was covered by a pliable mosaic of small, close-set plates. It was further protected by a movable plate that could be dropped down like a shutter over each eye, thus completing its protection from insects and formidable foes.

Preying on the various herbivorous kinds were powerful flesh-eaters, *Albertosaurus*, resembling those shown on page 429—an active animal 30 feet long and about 15 feet high. Armed with large, serrate dagger teeth and sharp, bird-like claws, it was capable of destroying any of its herb-eating relatives. It walked habitually on its hind legs, balanced by a long tail, while the short, reduced front legs could have been used only in grasping its prey.

That great numbers of these creatures lived in the ancient marshes is evident from the numerous remains found in the rocks. In a single quarry, of which there are many on the Red Deer River, bones representing several hundred individuals have been washed out of the bank, and more or less complete skeletons and in-

HIGH UP ON THE FACE OF A STEEP CLIFF WE FOUND A PARTIAL SKELETON OF THE WONDERFUL ARMORED DINOSAUR ANKYLOSAURUS (SEE PAGE 413)

The skull lies just above the pick. The skeleton was disarticulated, but all bones were found on the same level as deposited millions of years ago. To secure the specimen, the whole face of the hillside was blasted off, making a cut 30 feet long, 40 feet high, and 20 feet back into the hill, before all of the bones of this specimen were secured.

dividual bones are scattered all through the strata.

WHEN SOUTHERN CANADA HAD A FLORIDA CLIMATE

At that time southern Canada and the northern part of the United States enjoyed a climate similar to that of Florida, for fig fruits and palm leaves are often found in these same rocks. Numerous coal veins and petrified wood bespeak the tropical abundance of the vegetation.

Above the *Edmonton* beds, flanking the mountains, there are several hundred feet of sandstones and clays called the *Paskapoo* beds, which were deposited after the dinosaurs became extinct (see page 412).

These strata mark the beginning of the Age of Mammals. The giant reptiles had disappeared; their remains are never found in this formation; but in places the beds contain mammal teeth, small bones, leaves, and fresh-water shells.

It is probable that when this formation was deposited the country had been sufficiently elevated to drain off the marshes, and that the drainage of the waters was the chief cause of extinction of the dinosaurs. They were creatures that did not migrate any great distance to more favorable conditions, as do mammals, and it is quite possible that the particular food of the herbivorous forms became scarce. The known plant remains are

"BAD LANDS" OF THE EDMONTON FORMATION OPPOSITE THE MOUTH OF BIG VALLEY

This is the most picturesque section along the Red Deer River. Rains rapidly wash away the soft, friable clays, eroding the hillsides like organ pipes and exposing the fossil bones. The hard sandstone layers resist erosion and form terraces. Here we found dinosaur bones in abundance.

quite similar to those in the rocks immediately below, and inferentially the temperature had not changed.

The geologic formations along the Red Deer were first determined by the Canadian Geological Survey, members of which secured a variety of fossils, chiefly from the *Judith (Belly) River* formation, where the fossils are better preserved and more abundant than those in similar rocks in the United States.

HOW AND WHERE COLLECTORS HUNT BIG GAME OF THE PAST

Usually fossils are found in "Bad Lands," a name applied by the Jesuit missionaries to desolate regions denuded of grass and eroded into picturesque hills and ravines. In such places camp is located near some spring or stream, and the collectors ride or walk over the exposures till the region is thoroughly explored.

Quite different are the conditions on the Red Deer River. In places the canyon walls are nearly perpendicular, and the river winds in its narrow valley two to five hundred feet below the prairie, touching one side, then crossing to the other, so that it is impossible to follow up or down its course any great distance, even on horseback.

For many years the American Museum of Natural History of New York City has been making a systematic collection of fossils along this river, sending an expedition there every summer, and each succeeding expedition has returned with notable results. As the only feasible way to work these banks is from a boat, the parties proceed to the town of Red Deer, where the Calgary-Edmonton Railroad crosses the river.

There, with the aid of several carpenters, we constructed a flat-boat, 12 by 30 feet in dimension, similar to a Western

THE PICTURESQUE "BAD LANDS" OF THE BELLY RIVER FORMATION AT THE HEAD OF SAND CREEK, UNUSUALLY RICH IN MORE OR LESS COMPLETE SKELETONS (SEE ALSO PAGE 422)

ONE OF THE HORNED DINOSAURS, MONOCLONIUS (SEE PAGE 426)

This skeleton was complete from the tip of the tail to the end of the beak. Even the tongue bones were preserved in position.

ferry-boat. It was built upside down, and when calked water-tight was turned over and launched in the river near by. This boat was capable of carrying ten tons with safety (see page 411).

As the river has a speed of four miles per hour, we never intended to go upstream; so the boat was made on broad lines to be carried down by the current, its course directed by two great sweeps, or oars 22 feet long, one at each end of the boat, and nicely balanced on the gunwale, so that a man could push against it with his entire strength.

Supplied with a season's provisions, lumber for boxes, and plaster for encasing bones, we began our fossil cruise down a canyon that once echoed songs of the "Bois Brûlé," for this river was at one time the home of many fur-bearing animals and within the Hudson Bay Company territory.

The first sixty miles of the river below the town of Red Deer is locally known as "the Canyon," where the speed of the current is considerably more than four miles per hour, but there are alternating stretches of slow-moving water and rapids at low water dangerous to rafts and large boats.

THE SAUROLOPHUS SKELETON UNCOVERED AND READY TO BE ENCASED IN PLASTER AND BOXED, PREPARATORY TO ITS LONG JOURNEY TO THE MUSEUM

The skull at the lower end of the picture is still surrounded by ripple-marked sandstone; the tail extends under the man. It was covered over by four feet of clay and a few spines of the vertebræ were sticking out of the bank, giving us a clue to its location.

THE SKELETON OF THE NEW CRESTED DINOSAUR, CORYTHOSAURUS, FOUND NEAR STEVEVILLE

This is an unusually complete skeleton more than thirty feet long, with the impression of the skin still preserved on the under side. In this type of "duck bill" the skull was surmounted by a high, curved crest, like that of a cassowary. The end of the tail was exposed, giving a clue to the skeleton.

Spruce and poplar trees cover this section of the country, and each bend of the river presents some picturesque vista of especial interest, the stately spruce trees, silhouetted against the sky, adding a charm to the ever-changing scene. Forest fires and lumbermen have thinned out most of the larger trees, and for miles along the river the underbrush was colored pink by the ripe red raspberries.

In the long midsummer days, in latitude 52°, there are many hours of daylight, and constant floating would have carried us many miles per day; but frequent stops were made to prospect for fossils, and we rarely covered more than twenty miles per day. High up on the plateau buildings and haystacks proclaim a well-settled country, but habitations are rare along the river, and for miles we floated through picturesque solitude, the silence unbroken save by the noise of the rapids.

During the day an occasional flock of ducks or geese would be disturbed by our approach, though few signs of life were seen along the shore; but among the trees, when the mystic hush of night had stilled the camp, all the underworld was alive, and many little feet rustled the leaves where daylight disclosed no sign of life.

THE NIGHT SOUNDS OF WILD LIFE

Then the muskrat and beaver would take courage to investigate the big intruder of their familiar haunts. From the distance some hungry coyote would send his plaintive cry echoing down the canyon, to be punctuated by the "put-put-put, put, put" of a partridge drumming to his mate, and from the trees above came the constant query, "Who-who—who-who-oo?"

At intervals we would tie up the boat and go ashore to search the banks, that fossils might not be overlooked. No large fossils were found in rocks of the

ANOTHER ANKYLOSAURUS QUARRY

Lowering a 700-pound box, by means of block and fall, to the valley 100 feet below. This specimen included the pelvis, a part of the animal not before known.

Paskapoo age, but as soon as the *Edmonton* rocks appeared in the banks large bones of dinosaurs became numerous, and in the picturesque exposures at the mouth of Big Valley they were especially abundant.

EXCAVATING WITH CROOKED AWL AND WHISK-BROOM

At the foot of a butte lie scattered fragments of bone, and on the rivulet-scarred hillside other fragments appear, as we trace them up the waterways. Finally, ten, twenty, or thirty feet above, other pieces protrude from the bank, and this is our lead. Cautiously we follow in from the exposed surface, uncovering the bone with crooked awl and whisk-broom, careful not to disturb the bone itself; for, although stone, it is usually checked and fractured in many places by former disturbance of its bed or crystallizing of mineral salts, and is rarely strong enough to permit removal.

Other bones may appear in the course of this preliminary work, and, if the find is desirable, the next step is carefully to gather every fragment, large and small, that has weathered out and fallen down the hillside; for when restored in the laboratory one of these pieces may be the critical point in the determination of a species.

Then with pick and shovel the heavy ledges above are removed, and often a team and scraper and dynamite are used when a large excavation is to be made. As we near the bone layer the work is more carefully done, with ever in mind the probable position of the bones of the skeleton. A false stroke of the pick in excavation may cause days of mending in the laboratory and might destroy some delicate bone.

When the bones are uncovered and brushed clean they are saturated with shellac till all small pieces adhere to each other; then the dirt is taken away from

THREE MILES ABOVE TOLMAN FERRY WE FOUND THE HIPS AND PART OF A SKELETON OF A NEW, LONG-SPINED DINOSAUR NAMED HYPACROSAURUS

The hip bones alone weighed 600 pounds and had to be dragged to the river on a sled. It belongs to the family of duck-bill dinosaurs (see page 408).

the sides, more shellac applied, and finally each bone stands on a little pedestal.

HOW THE MONSTER SKELETONS ARE PACKED

If the specimen is a skeleton, we next determine where the bones may be separated or broken to cause least damage, and each part is covered first with tissue paper, and then with two or three layers of plaster-of-Paris bandages—strips of burlap dipped in plaster. When this is set and thoroughly hard, the block is undermined and turned over and bandages are applied to the lower surface to form a complete plaster jacket.

This preparation is slow and tedious. A skeleton may be uncovered in three days, but it will often take three weeks to prepare it ready for boxing. Then heavy

HAULING THE COLLECTION OUT OF SAND CREEK (SEE ALSO PAGE 416)

Up this converted cow trail a ton of weight may be a big load for six horses. Under the rich, black surface soil, the level prairie lands are composed of sedimentary clays, through which the Red Deer River has cut a miniature Grand Canyon. Although these rocks are of sedimentary origin, they were deposited in ages gone by, when this area was near sea level, while the rivers that are now cutting away the material are of comparatively recent origin.

OFTEN SKELETONS ARE FOUND IN ALMOST INACCESSIBLE PLACES, FROM WHICH THE PREPARED BLOCKS MUST BE DRAGGED ON THE SLEDS AND LOWERED OVER STEEP CLIFFS

One section of a large carnivorous dinosaur skeleton weighed over two tons. Here a trail had to be made up the steep canyon wall, where a 700-pound box was all that a team could drag on a sled.

boxes are made to dimension for each large block or several smaller ones, and the fossils are carefully packed in hay for shipment to the Museum.

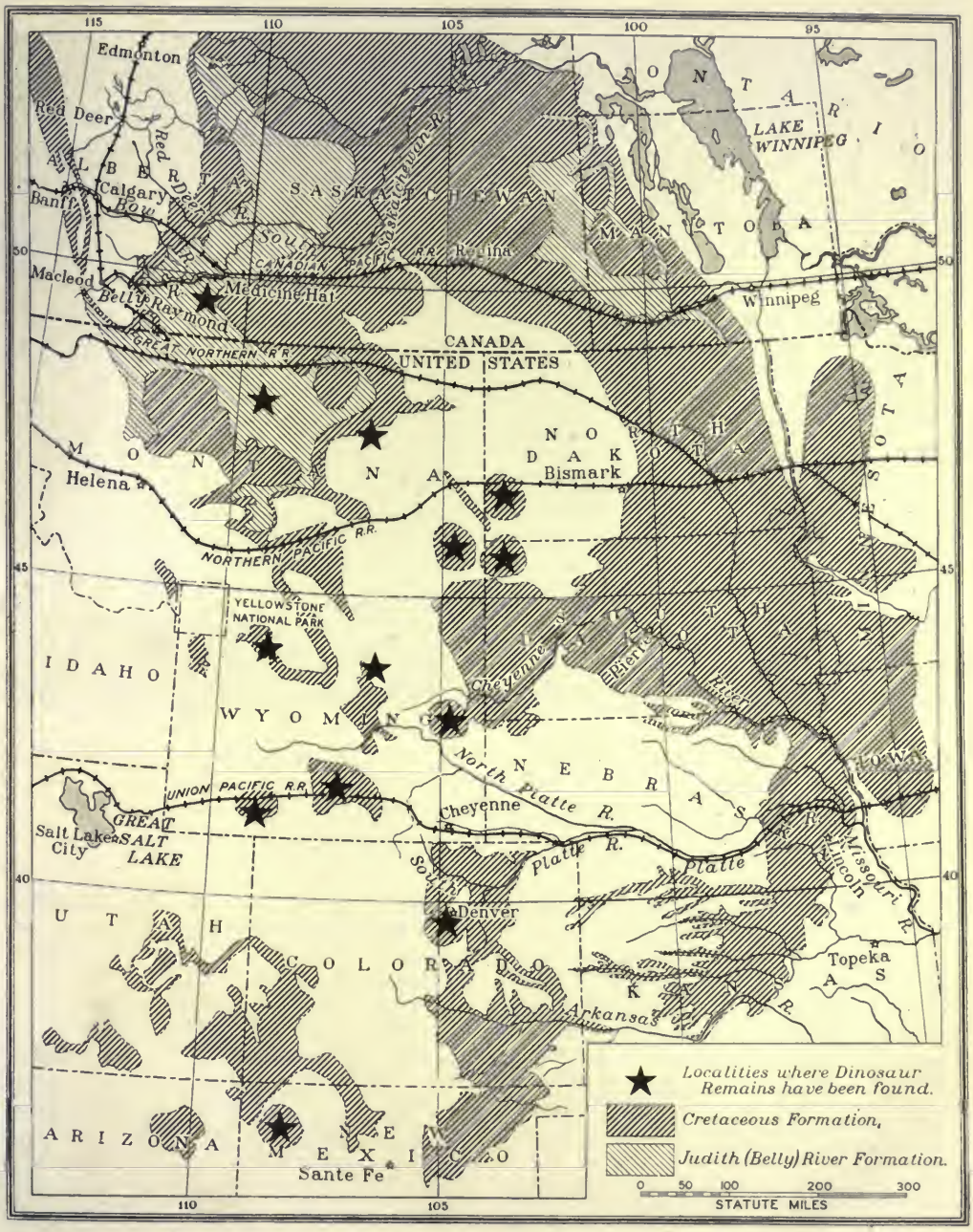
Thus, at Tolman Ferry a few fragments which were seen protruding from a hillside developed into a complete skeleton. At first it was thought to be the well-known "duck-bill" dinosaur *Trachodon,* but when the skull was revealed it was seen to be quite different. It proved to be related, but a form entirely new to science and since named *Saurolophus,* meaning crested saurian, from the long spine extending backward from the top of the head.

ZEST IN THE HUNT

Today there are thousands of different species of reptiles inhabiting the earth, and during each of the long prehistoric periods there were probably as many or

FREQUENTLY THE PREPARED BLOCKS WEIGH A TON OR MORE, AND IT IS NECESSARY TO HANDLE THEM WITH BLOCK AND TACKLE

HALF-GROWN DUCKLINGS ARE EASILY CAUGHT BY HAND, AND THE EARLY SETTLERS SALTED THEM DOWN IN BARRELS FOR THE WINTER'S MEAT



MAP SHOWING THE LOCATION OF SOME OF THE IMPORTANT FINDS OF DINOSAURIAN REMAINS AND AREAS WHERE DEPOSITS WERE LAID DOWN DURING THE TIME THAT THESE ANIMALS LIVED

The most fertile field for the hunter of big game of other days is a vast area of level land, prairie in the east and forested near the mountains, in the province of Alberta, Canada, between the Great Lakes and the Rocky Mountains, just north of the Canadian boundary. In the lower reaches of the Deer River, which drains a part of this region, sea-shells are found in the rocks, indicating that an inland sea, which extended from the Gulf of Mexico to the Arctic Ocean, once covered this area. When the sea-floor was elevated above the ocean this section became a vast jungle-covered swamp. In these marshes of prehistoric times dwelt a host of reptiles known as dinosaurs (see pages 407 and 409).

© American Museum

RESTORATION OF MONOCLONIUS MADE UNDER THE DIRECTION OF PROF. E. D. COPE, BY CHARLES R. KNIGHT

This is one of the primitive horned dinosaurs, the Ceratopsia, in which the horn over the nose was largest. In the later members of the family the horns above the eyes are largest (see page 427). Its remains are quite abundant in the Belly River beds.

more different kinds, for reptilian life is now on the wane.

Rarely does a season pass without several new genera being brought to light, and this possibility of discovery of the new and unknown adds zest to an already fascinating field of research. Any prospect may reveal some new creature of bizarre form, and we are constantly finding skeletons of animals known before by parts only.

The *Edmonton* formation has been especially interesting, for at least two-thirds of the species discovered in rocks of that age are new to science.

By the time we had reached Tolman, where a road crosses the river, our flatboat, piled high with boxes of fossil animals, had become a veritable fossil ark. This was in the latter part of September; thin ice was forming on the river and it became too cold to do further effective collecting. The boat was then beached for the winter and the collection shipped back to the Museum.

Each summer work has been continued from the point at which it ceased the year before and the search has been carried on thoroughly.

Elsewhere complete dinosaur skeletons are rare, but in this part of Alberta they are not uncommon. In no other part of the world have so many Cretaceous dinosaur skeletons been brought to light. One American Museum Expedition collected eight skeletons from a limited area exposed along three miles of the Red Deer River.

CAMP LIFE WHILE ON THE HUNT

Searching for prehistoric animals by boat is even more interesting than similar work in the arid "Bad Lands" of the plains. Those who have husbanded drinking water on the desert through long hot summers keenly appreciate a river of snow water.

Pike, pickerel, and sturgeon are caught in the Red Deer, and the persistent angler never fails to land a few "gold-eyes," a

After U. S. National Museum, from a drawing by Charles R. Knight

THIS EXTRAORDINARY DINOSAUR (TRICERATOPS, UPPER CRETACEOUS, NORTH AMERICA) WAS A STRICTLY LAND FORM AND GREW TO A LARGE SIZE—25 FEET IN LENGTH

The head, with its accompanying neck frill, was enormous—8 feet in length in the large specimens. The creature was herbivorous, the jaws containing many fine teeth, evidently used in crushing vegetable food. The enormous horns grew upon a bony cover, as do the horns of a cow, and the upper jaws ended in a horny, turtle-like beak. The two erect dinosaurs in the background are Trachodons, a contemporaneous species (see page 408).

species of fresh-water herring delicious when properly baked.

After a long day's search along the face of the hillsides or work in the quarry, the collector returns to camp hungry and exhausted, but soon to be revived by a good camp supper. Then the hour before sundown is spent with rod or motor-boat. The winds have ceased, and as the sun disappears over the rim, long purple shadows conjure fantastic forms on the rugged canyon walls; then a cheerful camp-fire, pipes, and stories of other days and scenes.

All, of course, are not roseate scenes. The particular fly in our ointment has been the mosquitoes, which last year flocked to anything that moved, in numbers that I hesitate to estimate. But to the lover of camp life the days of discomfort and privation are those soonest forgotten.

As a result of the past four years' work in Canada, the American Museum Expeditions have collected 300 large cases, or three and one-half carloads of fossils, two-thirds of which are exhibition specimens, including twenty skulls and fourteen skeletons of large dinosaurs, besides many partial skeletons. This material represents many genera and species new to science, and defines the anatomy and distribution of several heretofore but partially known creatures.

But the field has by no means been exhausted. Under miles of prairie land the same strata are undoubtedly filled with similar fossils; erosion is rapid, and as the river continues to wear its banks away new fossils are exposed. In a few years the same territory can be explored with similar results, and for all time to come the Red Deer River will be a classic locality for collecting prehistoric treasures.

A GREAT MARINE LIZARD-LIKE FORM FROM THE KANSAS CHALK

The long and powerful jaws were armed with numerous sharp teeth and the limbs were developed into short paddles. The specimen here shown is some 30 feet in length and was found in almost perfect condition.

A SMALL, ACTIVE DINOSAUR, ABOUT FIVE FEET IN HEIGHT, FOUND IN WYOMING

The picture shows one capturing an ancestral bird whose jaws contained sharp teeth like those of a lizard.

After Osborn, from a drawing by Charles R. Knight

THIS FORMIDABLE DINOSAUR, THE LARGEST OF THE CARNIVOROUS FORMS, WAS SOME 40 FEET IN LENGTH (SEE PAGE 413)

It must have presented a most imposing sight as it stalked about in search of food. The great 5-foot jaws were armed with long and sharp teeth, capable of tearing the tough skins of such antagonists as the great Triceratops of the same period (p. 408). This latter creature could not escape by running away, and so was forced, no doubt, to back into some dense forest growth whenever possible, presenting merely its sharp-horned head to its adversary.

After Osborn, from a drawing by Charles R. Knight

THIS GREAT CARNIVOROUS DINOSAUR HAS BEEN KNOWN FOR SOME YEARS PAST, BUT ONLY RECENTLY HAS A COMPLETE SKELETON OF IT BEEN PLACED ON EXHIBITION

The creature is depicted feeding upon the remains of a Brontosaurus, whose actual vertebræ, chiseled by the sharp teeth of some similar creature, are placed beneath the mounted skeleton in the American Museum.

INDIANA'S UNRIVALED SAND-DUNES—A NATIONAL PARK OPPORTUNITY

By Orpheus Moyer Schantz

A DUNE region ordinarily signifies an inhospitable, wind-swept tract of country, barren of vegetation and sparsely inhabited by animal life. The term "sand-dune" long ago denoted a land to be avoided by travelers whenever possible. Lack of water, intense heat, and the ever-drifting sand itself were sufficient causes for shunning any dune country as a highway. Charles Kingsley, in Westward Ho, says: "The Spaniards neared and neared the fatal dunes that fringed the shore for many a weary mile."

The dunes of the Atlantic coast, driven inland by the terrific storms off the ocean, at times have devastated large areas of fertile land, relentlessly destroying all vegetation, and the dune regions of interior America were the bane of early pioneers.

At the head of Lake Michigan, including the entire shoreline of Indiana and parts of the adjoining shores of Illinois and Michigan, there is a dune country, unique and wonderful and entirely different from our usual ideas of sand-dunes.

The vegetation of the average desert or sandy region is usually an interesting example of the survival of the fittest, and most of the plant families remaining have adapted themselves to the severe

Photograph by Frances La Follette

A POPLAR WHICH CONVERTS ITS BRANCHES INTO ROOTS AND ITS ROOTS INTO BRANCHES, AS THE WIND BLOWS

At one time this tree of the Indiana sand-dunes was buried up to the dark line. The limbs then did duty as roots, but now that it is being uncovered they are again performing their normal function as limbs.

Photograph by J. R. Daniels

A FIND FOR THE ORNITHOLOGIST

He sits and blinks the day away amid trees and shrubs of bewildering beauty growing on the shores of a fresh-water sea.

Photograph by H. Mertsky

THE OUTLINES OF THE DUNES ARE ALWAYS GRACEFUL

Their size is indicated by comparison with the human figure. The lake appears in the distance.

Photograph by Alfred L. Fitch

UP HILL AND DOWN DALE IN INDIANA'S COMBINATION DESERT AND OASIS

The verdure-clad billows of sand constitute a veritable botanical garden, which is a paradise for birds and plants of many species.

Photograph by Arthur E. Anderson

AT THE HEAD OF LAKE MICHIGAN THERE IS A DUNE COUNTRY UNIQUE AND WONDERFUL

It includes the entire shoreline of Indiana and parts of the adjoining shores of Illinois and Michigan.

Photograph by A. E. Ormes

A WINTER LANDSCAPE IN THE DUNES

Photograph by Irwin S. Rosenfels

THE INDIANA SAND-DUNES AND LAKE MICHIGAN SHORE

conditions of their environment. Desert plants, too, are often strikingly beautiful when in blossom; but their period of growth and luxury is very short, lasting only through the rainy season.

A SEA OF SAND, BUT NO DESERT DROUGHT

Conditions are reversed in the Indiana dunes, for here there is never a long period of drought, and in place of a desert area there is a natural propagating garden, where a most astonishing number of rare and beautiful plants congregate, having migrated both from the north and south to this unusually favored locality (see pages 434-435).

Here, on the shores of a great fresh-water sea, whose moisture is constantly being carried southward by the prevailing northwest winds, and tempered both in summer and winter by its position on the lake, is a region so wonderful that it should be kept for all time as a great natural park for study and the recreation of millions of people of the Middle West.

There are about 20 miles of shoreline, averaging a mile or more in width and containing approximately 30 square miles of land in the dunes, still unspoiled by commercial industries. This region is situated within easy reach of more than 10,000,000 people at a nominal cost for transportation.

A visit to almost any one of the national parks is a luxury beyond the reach of the majority of the people of the Middle West; but the Lake Michigan dune region can be visited at all seasons and at a cost of, at the most, a few dollars. The dunes are popular even in mid-winter, and many a party of students and other outdoor enthusiasts has enjoyed the scenery and the bracing air of the lake at that time of year (see pages 437, 440).

MANY CHARMS FOR MANY MEN

The attractions of the dunes are so varied that all classes may here find recreation suited to their wishes. The tramper, the geologist, the botanist, the zoölogist, the student of early American history, and those who seek only fresh air and clear skies, can find all they desire, and more than they hoped for, in

Photograph by H. Mertsky

AMONG THE LUPINES IN THE SAND-DUNES

Great masses of bird's-foot and other violets, lupines, phlox of different colors, trilliums, waxy bells of wintergreen and blueberry, hepaticas, trailing arbutus—not just a few flowers, but acres of them and miles of acres—make a natural flower garden which cannot be duplicated artificially.

Photograph by L. T. Gable

WHERE THE WAVES BREAK UPON THE DUNES OF INDIANA

Canoeing here resembles the exhilarating sport of surf-board riding in the Hawaiian Islands.

Photograph by Arthur E. Anderson

THE TOPOGRAPHY OF THE DUNES LENDS ITSELF TO THE FORMATION OF MARVELOUS PLANT SOCIETIES

this wonderland of sandy beach and forested lake shore.

The outlines of the dunes are always graceful; for Nature, though sometimes cruel, displays wonderful skill as an artist, and the exposed wind-carved sands are arranged in beautiful curves and outlines against the sky.

The topography of the dunes lends itself to the formation of marvelous plant societies: great shallow ponds, with their typical borders of marsh-loving plants; deep, sheltered hollows, perfectly dry at the bottom; active stream beds, thickly fringed with willows, alders, and buttonbush, with thickets of giant mallows on the mucky shores; north slopes, with trailing arbutus, wintergreen, partridge berry, hepaticas, and violets, and rare ferns and orchids spread in artistic profusion; moving dunes, whose leeward sides extend slowly and surely south, in time covering even tall trees, with their smothering blanket of sand; old dunes, clothed to their crests with vegetation, and at intervals "blow-outs," where reverse winds have uncovered ghostly tree trunks, gray and weather-beaten and entirely denuded of bark, but the wood still sound and perfectly preserved by the sand shroud with which it was surrounded.

PLANT LIFE OF MARVELOUS VARIETY

Many trees adapt themselves to the severe conditions on the more exposed dunes, frequently sending out roots from the trunk to take advantage of the encroaching sand, and if again uncovered the roots immediately function as branches. This is particularly true of the cottonwood, which also sends out roots of remarkable length close to the surface of the sand, in this way making use of surface moisture (see page 430).

Trees, shrubs, and many plants from the far north grow side by side with others whose natural habitat is many miles south of the lake, and the plant life is bewildering to the uninitiated and a joy to the botanist. The combination of underlying sand and humus, with abun-

Photograph by Frances La Follette

SAND-DUNE WOODLANDS IN WINTER

Each succeeding season among the dunes brings its pictures of natural beauties and scenic charms.

dant moisture, makes a condition of soil that is ideal, and the result is a luxuriant plant growth that is almost tropical.

The dune-floor vegetation is more striking than the arborescent growth, and the wealth of herbaceous plant life is remarkable. Even on the exposed lake beach and on newly formed sand drifts pioneer plants are constantly springing up. Hardy grasses, sea rockets, artemisias, sand cherries, and many others take advantage of the slightest opportunity, and around these plants embryo dunes form, which in time grow and join the ever-changing and fascinating panorama of dune succession.

As soon as a slight covering of humus accumulates, possession is taken by the stronger plant growth, and bearberry, juniper, arrow woods, and sumacs soon fill up the vacant spaces, preparing the way for the tree growth that is waiting its turn.

The black oak is the most conspicuous tree of the older dunes, but it is accompanied by many others, mostly deciduous, although there are a few evergreens and one other conifer—the tamarack.

Basswood, poplars, tulip, sassafras, juneberry, flowering dogwood, white and gray pines, and occasionally white oaks, are all to be found in the drier parts of the dunes; and in the lower lands sour gum, red maple, swamp white oak, pawpaw, cherry, and the larger sumacs grow luxuriantly in the peaty soil.

A NEW GREEN FOR EVERY SEASON

Each season in the dunes has its own individual attraction. In springtime the dark greens of pines and junipers make a fitting background for the delicate shades of the opening foliage of the deciduous trees, with their soft greens, pinks, and reds. Great splashes of white blossoms of shad bush, cherry, plum, and viburnums; the striking blossoms of flowering dogwood and button bush; masses of red maple pendants and the delicate coloring of the oaks make a strong appeal to the esthetic sense of the lover of Nature.

Over all the taller growth are scattered draperies of vines, softening the rigid outlines and adding their blossoms to the marvelous display.

The herbaceous plant life is even more varied and wonderful. Great masses of bird's-foot and other violets, lupines, phlox of different colors, trilliums, waxy bells of wintergreen and blueberry, hepaticas, trailing arbutus—not just a few flowers,

but acres of them and miles of acres—make a natural paradise which cannot be artificially duplicated (see page 434).

The marshes have their own individuality of sedges, cat tails, reeds, and borders of the larger ferns—royal, cinnamon, and interrupted. The Virginia chain fern in one of the drier marshes crowds out the less vigorous plant life, coloring with its fertile fronds great stretches of the marsh a beautiful sepia. The blending of browns and greens in the marshes softens the landscape to an exquisite symphony of color in pleasing contrast to the more vivid coloring of the higher land adjoining.

AUTUMN'S FLAMING DUNE LANDSCAPE

It is in autumn, however, that the dune coloration is at its best, for then the entire region becomes a flaming landscape of gorgeous reds and yellows. Nature goes into her winter rest with a last effort in color that is beyond adequate description. The sour gum, red maple, sumacs, and sassafras discard their modesty and vie with each other in a gorgeous riot of autumn coloring. The foliage of the black oak, as it changes, combines red, green, and bronze, and covers the ridges with a garment of beauty.

Photograph by Frances La Follette

THIS IS A SAND-DUNE COVERED WITH SNOW

The dune country, easily accessible to 10,000,000 Americans, has its special lure for every month of the year.

Many of the trees and lesser shrubs and other plants bear edible fruits, providing a sumptuous larder for hosts of birds and small animals. The bird life of the region surrounding the end of Lake Michigan is very abundant, and during migrations nowhere in the United States are there more varieties of both land and shore birds to be seen than here.

Conditions of food, shelter, and climate are particularly favorable for these visitors. Although the game birds are sadly persecuted, they still visit the dunes in great numbers each year, scarcely a season passing without having among its records some rare migratory visitor or new nesting record.

The ruffed grouse, golden eagle, horned owl, and the great blue heron still visit the dunes, and in winter-time the evening grosbeak, crossbills, and pine finches are attracted by the wealth of food.

Geologically, the dunes and distinctly traceable old shorelines tell the fascinating story of the Glacial period antedating Lake Michigan. The near-by universities bring their classes to the dunes

Photograph by H. P. Cook

THE SCENE OF A PAGEANT PORTRAYING THE EARLY HISTORY OF THE INDIANA SAND-DUNES

This pictorial presentation of the events which made this region a part of the American Union was fittingly staged in a natural amphitheater formed by the dunes themselves. It was through the dune country that the French pioneers found their way from Detroit to the site of Chicago.

Photograph by Irwin S. Rosenfels

DOWN MOUNT TOM: INDIANA SAND-DUNES

as a most necessary object-lesson of their natural-science courses.

HISTORIC ASSOCIATIONS IN THE DUNE COUNTRY

Historically, also, the dunes have their place in the earlier history of the West. The old Indian trails can still be pointed out, and it was through the dunes that the pioneer French found their way from Detroit to the site of Chicago, at the mouth of the Chicago River.

Nature organizations of Chicago and Indiana have done much to bring the dunes to the attention of thousands of people who never before knew them except superficially from the railroad or trolley line, and each year they are becoming better known and appreciated.

As a result of this education the residents of the adjacent country are beginning to realize that they have a truly remarkable forest area within a few hours' ride; that miles of beautiful beaches are free to the tired city dweller, and that here they can go out in the pure air and see the sun rise and set over the lake, without a sign of skyscraper or factory visible anywhere.

The consideration of the dunes as a national park has received the serious attention of Congress to the extent that in 1916 a public hearing was held in Chicago to gather data in connection with the proposed project. At this hearing hundreds of men and women of prominence gave evidence as to its advantages.

In the spring of 1917 a pageant was given in a great natural amphitheater in the dunes, which vividly portrayed the early history of the dunes, illustrating with striking exactness the stirring events which made it American.

SHALL THEY BE PRESERVED?

The interest of the public in the dunes has been materially advanced by the public hearing and the great pageant, and a new epoch has been reached in the campaign for their preservation. If this re-

WHEN ARCHITECT WINTER BUILDS AMONG THE SANDS

YOU MIGHT BE WITH PEARY, BUT IT IS ONLY THE DUNES

IN THE "HIGH ALPS" OF THE DUNES

AN ICE BRIDGE ALONG THE DUNES

The snow king converts the southern shores of Lake Michigan into the semblance of Greenland's icy mountains. Photographs by C. G. Dudley.

gion is allowed to pass into the hands of commercial industries, the people of the State of Indiana and of the entire country will lose for all time their free access to Lake Michigan.

The importance of prompt action cannot be urged too strongly, as the demand for large tracts of land with railway and water facilities would soon result in the destruction of the natural advantages of this remnant of scenic beauty and fascinating forest and plant life.

Under commercial occupancy the growth of centuries could be destroyed in a short time. It would be a catastrophe if this opportunity for preserving an incomparable breathing spot on Lake Michigan should be neglected.

HELIUM, THE NEW BALLOON GAS

By G. Sherburne Rogers, Ph. D.

Of the United States Geological Survey

HELIUM, the new incombustible gas which promises to revolutionize the science of ballooning, appears to be the latest addition to the long list of natural products with which the United States is bounteously endowed. In fact, the only workable supplies of the gas that have yet been discovered anywhere in the world are found in the United States, and this country thus has a powerful advantage in the competition for supremacy in the air which the next decade is bound to witness.

The history of helium, which derives its name from the fact that it was first discovered in the sun—almost 30 years before it was identified on earth—and which was later found to be related to that most precious and wonderful of all elements, radium, is in itself of interest; but the discovery of the supposedly rare helium in ordinary natural gas by one scientist, the conception of another that helium would be ideal for inflating balloons, and the labors of still others in devising methods for extracting it from natural gas and in locating supplies adequate for this country and its allies, form an interesting chapter in the account of America's contribution to the war.

The qualities of helium that make it so valuable for use in balloons are its lightness and its incombustibility. Helium is the lightest of the so-called inert gases, which do not combine with oxygen or any other substance and therefore cannot explode or burn.

Hydrogen, the gas commonly used in filling balloons, is, on the other hand, highly inflammable. Many a great balloon, or rigid airship, costing thousands or hundreds of thousands of dollars to construct, has been destroyed by fire in a few minutes—some by lightning, some by sparks from the motor, and others by any one of the numerous accidents that may happen even when the craft is in its hangar.

WEAKNESS OF HYDROGEN-FILLED BALLOONS

In military balloons or airships the fire hazard is, of course, greatly increased, a single well placed incendiary bullet being sufficient to transform the whole costly structure into a mass of flames; and in this event the fate of the crew is practically sealed. This weakness, inherent in all hydrogen-filled balloons, was not only a potent factor in the practical failure of the German Zeppelin program, but has always been a drawback to the development of lighter-than-air craft.

With the fire hazard completely eliminated by the use of helium, however, the risks of ballooning are greatly decreased and many new possibilities open up. The power plant of the airship may be placed as close as desired to the great gas bag without fear of sparks, and by thus making the design more compact, and so re-

Photograph courtesy Division of Military Aëronautics

EXPLOSION OF A HYDROGEN BALLOON, FORT SILL, OKLAHOMA: SUCH AN ACCIDENT WOULD HAVE BEEN IMPOSSIBLE HAD THE GIGANTIC BAG BEEN FILLED WITH NON-INFLAMMABLE HELIUM

In peace as well as in war any one of a score of mishaps can cause such a catastrophe, so long as hydrogen is used as the buoyant gas for dirigibles. A defective electrical connection, a spark from the wireless apparatus, a stroke of lightning, or an incendiary bullet in time of war are some of the agencies of destruction.

Photograph courtesy Division of Military Aëronautics

ALL THAT IS LEFT OF A HYDROGEN BALLOON AFTER THE EXPLOSION SHOWN ON THE PRECEDING PAGE

ducing the wind resistance, the speed and cruising radius of the craft may be materially increased.

MACHINE-GUNS CAN BE MOUNTED ON TOP OF HELIUM AIRSHIPS

In military airships machine-guns may be mounted directly on the envelope instead of being tucked away in the gondolas, as far as possible from the dangerous gas; and, on the other hand, all danger of attack with incendiary bullets disappears. This is not simply theory; tests have been conducted on model balloons filled with helium, and all efforts to explode them or bring them down with incendiary bullets failed.

There is always a chance in a thousand that an anti-aircraft shell might explode directly within the envelope, and it might also be possible to bring down a helium-filled balloon by driving an airplane through it bodily, but otherwise it would seem to be invulnerable.

Assistant Secretary Roosevelt, of the Navy, has summed up these advantages in his statement that "with the fire risk eliminated, the rigid airship, or Zeppelin, will be one of the most powerful weapons known."

The only apparent disadvantage of helium is the fact that it is about twice as heavy as hydrogen, 100 cubic feet of helium weighing 17.8 ounces and the same volume of hydrogen only 9 ounces. Both gases, however, are so exceedingly light in comparison with air (which weighs 8 pounds per 100 cubic feet) that this is of little practical importance, the buoyancy, or lifting power, of helium being 93 per cent that of hydrogen. Moreover, this greater weight has its compensations, for hydrogen is so light that it passes through the walls of the gas bag and escapes at a far more rapid rate than helium.

THE SUN GAVE US THE CLUE TO HELIUM

Helium is one of nature's own products, being a true chemical element—a body that cannot be broken up or decomposed into other simpler substances—and is not to be confused with materials like mustard gas, which are manufactured compounds. Helium, moreover, is one of the most interesting of all the elements.

Prior to about 1860 the chemist could deal only with substances that he could actually hold in his hands and weigh on the chemical balance; but the invention of the spectroscope opened up a new field, for it permitted him to study at a distance the gases or vapors given off by all substances when heated.

The spectroscope depends on the familiar principle of the prism, which breaks up sunlight into the colors of the rainbow or spectrum; but it is arranged to take advantage of the fact that the light given out by a white-hot mass of iron, for example, produces certain characteristic lines rather than the continuous band of rainbow colors. Each element has its characteristic spectrum by which it may be identified, whether it happens to be on the laboratory table or in some distant star.

In 1868 an eclipse of the sun was visible in India, and for the first time the spectroscope was used to examine the colored atmosphere which envelops the sun.

Many of our familiar earthly elements, like sodium, iron, hydrogen, etc., were identified, but the British astronomer, Lockyer, observed a bright yellow line in the spectrum which did not correspond with that of any known substance. He concluded, therefore, that he had discovered a new element, and named it helium, after the Greek word for the sun, ἥλιος.

HOW HELIUM WAS FOUND ON EARTH

It was not until 1895, or twenty-seven years later, that helium was actually found on the earth, and the circumstances attending its discovery are interesting.

In 1888 Dr. Hillebrand, of the U. S. Geological Survey, found that the heavy, black mineral uraninite, when treated with acid, gave off an inactive gas, and having proved that this gas was in part nitrogen, he concluded, as no other such gases were then known, that it was all nitrogen. Four years later, however, Lord Rayleigh and Sir William Ramsay discovered a new element in the atmosphere—a heavy, inert gas which they named argon.

In 1895 Ramsay heard of Hillebrand's work on the inert gas given off by uraninite and at once suspected that this gas

Official photograph, U. S. Naval Air Service

RESCUING AN AVIATOR FROM ONE OF THE FLORIDA KEYS

To demonstrate the ease and accuracy with which its dirigibles can be navigated, the crew of one of the U. S. Navy's airships "marooned" one of their number on an island and sailed away. After a brief cruise, the dirigible was brought back and its rope ladder dropped overboard, within reach of the aviator who had been left behind. In the photograph the rescued man is seen climbing aloft as their airship resumes its journey.

might contain argon. Accordingly, he extracted some of the gas for himself; but he, too, was mistaken, for it proved to be not argon, but the element helium, which Lockyer had seen in the sun so long before.

After that, oddly enough, it was only a year or so before various other chemists detected helium in the atmosphere, in the gas given off by mineral springs, and in the volcanic fumes of Vesuvius. None of these gases, however, contain more than a fraction of one per cent of helium—the atmosphere itself contains only four ten-thousandths of one per cent—and although helium was thus found to be widely distributed, it was always regarded as one of the rare elements.

Although the discovery of helium in natural gas has proved to be a great boon to the United States, it was a rather sor-

Photograph courtesy Division of Military Aëronautics.

MILITARY OBSERVERS DESCENDING IN PARACHUTES FROM THEIR BALLOON

The observation balloon, which has been successfully attacked by a Hun aviator, can be seen far above. A moment after the taking of this photograph, at Dravigny, France, the kite balloon burst into flames as the result of incendiary bullets fired into its hydrogen-filled bag (see illustration, next page). The two observers can be clearly distinguished swinging safely to earth, sustained by the graceful white parachutes.

Photograph courtesy Division of Military Aëronautics

INCENDIARY BULLETS, WHICH DESTROYED THIS OBSERVATION BALLOON, WILL HAVE NO TERRORS FOR THE AËRONAUTS OF THE NEXT WAR (FOR THE FIRST PHASE OF THIS INCIDENT OF THE WAR IN THE AIR, SEE THE PRECEDING PAGE)

At the time of the signing of the armistice, America was just entering upon quantity production of helium. The first shipment to France of 150,000 cubic feet of the new balloon gas had been made. Gas fields already located in the United States are capable of producing, if the necessity arises, 250,000,000 cubic feet of helium gas annually for the next three years, and there are excellent prospects that other fields will be found.

Photograph from U. S. Naval Observatory

CORONA OF THE SUN DURING A TOTAL ECLIPSE: SCIENCE DISCOVERED HELIUM IN THE ATMOSPHERE OF THE SUN LONG BEFORE IT WAS KNOWN TO EXIST ON OUR OWN PLANET

It was during a total eclipse of the sun, visible in India in 1868, that Lockyer, a British astronomer, saw in the spectroscope a bright yellow line which did not correspond to the line of any then known element. He called it helium, after the Greek word for sun. Twenty-seven years later an element was found on earth which gave the same bright yellow line in the spectrum. Thus, what the sun had revealed half a century ago as existing more than ninety million miles beyond our reach, began to be studied at first hand in 1895. Today that gas promises to make the ship of the skies a safe and practical reality.

rowful event for one of its good citizens. In 1903 a well was drilled at the little village of Dexter, in southern Kansas, and a great flow of natural gas was encountered. The nearest gas field at that time lay a considerable distance to the east, and the owner of the well, having visions of Dexter becoming a great manufacturing center, invited the countryside to assemble and celebrate the event.

On the day appointed, and in the presence of a goodly crowd, the well was opened and the gas allowed to roar forth; whereupon, in order to make the demonstration dramatically complete, a lighted torch was thrust into the gas—and the

torch promptly went out. Several more attempts were made, but the gas absolutely refused to burn. Gloom descended on the assemblage, and visions of cheap fuel and manufacturing wealth went glimmering.

A sample of this gas was sent to the University of Kansas for analysis and the secret of its fireproof qualities was at once revealed, for it was found to contain only about 14 per cent of the combustible hydrocarbons which ordinarily make up natural gas, and to consist for the most part of nitrogen.

MILLIONS OF FEET OF HELIUM GAS WASTED

As nothing like this had been discovered before, Prof. H. P. Cady, of the University of Kansas, examined this inert portion of the gas further and finally discovered helium in it. He at once collected samples of gas from a number of other localities in Kansas and elsewhere and found a little helium in all but one; but the Dexter sample, which contained 1.84 per cent, was the richest of all.

I may add that all our recent work has confirmed this relation; gases high in nitrogen, and therefore poor in heating value, are likely to carry considerable helium; and, on the other hand, no high-grade hydrocarbon gas has been found to carry enough helium to be of value.

The announcement of Professor Cady's discovery created some interest in scientific circles, but as no one knew of any practical use for helium it had no commercial value.

After the Dexter episode similar gas was found at many points in southern Kansas, but because of its poor burning qualities it was contemptuously called the "wind gas." It was generally encountered at shallow depths by wells aiming for the deeper-lying oil sands, and, being usually under enough pressure to interfere with the drilling, was regarded as a great nuisance.

It was customary to allow this wind gas to blow wild into the air until exhausted; and how many million cubic feet of valuable helium have been wasted in this way no one can ever estimate.

No one seems to know just who conceived the idea of using helium in balloons, though apparently it originated in England. Like all great ideas, it is beautifully simple; yet, so long had helium been regarded simply as a chemical curiosity, that apparently the stimulus of war was necessary for the correlation of two well-known facts: first, that helium would be ideal for balloons; and, second, that plentiful supplies were available.

At any rate, within a few months after the war began a search for helium in the gases of English coal mines was started, but it met with no success. It was later extended to Canada, but the quantities of helium found in the natural gas there were too small to be of value.

Italy, when she entered the war, also took a hand in the search, and unsuccessful attempts were made to extract helium from the volcanic gases that issue from the fumaroles around Naples.

ORGANIZING THE CAMPAIGN FOR HELIUM PRODUCTION

When the United States joined the Allies, the military value of helium was at once brought to the attention of the Army and Navy authorities, and a vigorous campaign was begun for the production of helium in quantities sufficient not only for this country, but for England and France as well.

The two main problems were obvious: first, to develop methods of extracting helium from the natural gas; and, second, to determine the geologic occurrence of the gas, and so to locate adequate supplies.

The task of developing methods of extracting the gas was accomplished by the Bureau of Mines, acting in coöperation with the Army and Navy. Late in 1917 two small experimental plants using different methods were erected in Fort Worth, Texas, to treat the gas of the Petrolia field; and some months later a third plant, using still a different method, was erected in the field itself.

As the apparatus used in all these processes requires rather delicate adjustment and manipulation, some time was naturally consumed in determining the most efficient working conditions; but just prior to the armistice the first shipment of 150,000 cubic feet of helium, com-

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A SEXTET OF SKY-SCRAPERS READY FOR A FLIGHT AT U. S. ARMY BALLOON SCHOOL, ARCADIA, CALIFORNIA

The standard observation balloon of the United States Army has a capacity of 35,000 cubic feet of gas. At the present price of hydrogen, the cost of inflation ranges between $300 and $375. Helium gas can now be manufactured at less than 10 cents a cubic foot, but as its lifting power is somewhat less than hydrogen, inflation of a similar type of balloon with this non-inflammable substance would cost in the neighborhood of $4,000. This sum will be materially reduced if a third method of manufacture, now being tested, proves practical. The average Navy dirigible airship has a gas capacity of 100,000 cubic feet (costing for inflation with hydrogen from $850 to $1,100). The British superdreadnought of the skies, the R-33, is said to have a capacity of 2,750,000 cubic feet, which represents $25,000 to $30,000 worth of hydrogen gas.

pressed and stored in steel tanks, had been started to Europe. This was enough to fill four of the ordinary kite balloons, though the large dirigibles require one to two million or more cubic feet of gas.

A GREAT ACCOMPLISHMENT

Although quantity production of helium was achieved just too late to be of value in the actual hostilities, it was in itself a great accomplishment, for the world's total output of helium up to 1915 was probably less than 100 cubic feet, the market value of which was about $1,700 a cubic foot. Our helium, on the other hand, can be produced by the first two methods at less than 10 cents a cubic foot, and if the third process fulfills the expectations of Bureau of Mines experts, this figure will be still further reduced.

All of our helium so far, however, has been the product of the first two experimental plants; the third plant has not yet been put on a practical working basis, though the fact that it holds promise of producing helium much more cheaply than the other two justifies further experimentation with it.

The details of the process of extracting helium are highly technical, but the general scheme is easily understood. All of the main constituents of natural gas, including the nitrogen, become liquefied when cooled to about —328° Fahrenheit; but the helium remains a gas at this exceedingly low temperature and is thus easily separated.

The principle by which these low temperatures are attained is one known to every motorist who is unfortunate enough to have to pump up his own tires. When air is compressed in a tire it becomes hot; if the tire is allowed to cool to ordinary temperature and the valve is then opened and the air allowed to escape, it becomes cool.

Similarly, the natural gas is put under a very high pressure and then refrigerated, and when allowed to expand it becomes so cold that all of its constituents except helium be-

come liquid. The liquid, after being separated from the helium gas, is allowed to warm up until it returns to its normal gaseous condition, when it is put back into the mains and used as ordinary natural gas.

This process does not in the least injure the quality of the natural gas for heating purposes—in fact, it improves it, for the helium, the only substance removed, is incombustible.

THE SEARCH FOR HELIUM-BEARING GASES

While the experimental work on extracting helium was under way, members of the Geological Survey, of whom I was one, were engaged in a search for further supplies of the helium-bearing gas, for it was very evident that the Petrolia, Texas, field, in which operations were started, would supply only a fraction of the quantity desired by the United States alone. Furthermore, a gas field is an ephemeral thing, some fields lasting ten years and others only a year or so; so that it was necessary not only to keep the supply ahead of the demand, but to estimate as closely as possible how long each field would last, and in this way avoid the mistake of installing expensive machinery in a practically exhausted field.

This work was begun in June, 1918, and in September the Geological Survey was able to advise the military authorities that sufficient supplies of the gas had been located to furnish over five million cubic feet of helium per week, or enough to meet the demands of the United States and of Great Britain and France as well.

The search for helium was simplified by the fact that all the helium-rich gases are apparently poor in heating value, and information as to the heating quality of a gas is usually not difficult to obtain.

The richest gas is the "wind gas" of southern Kansas and northern Oklahoma, which for so many years had consistently been allowed to go to waste. A sample of this gas which I collected in the Augusta field, Kans., contained over 2 per cent of helium and is the richest variety known.

WHERE AND HOW THE GAS OCCURS

We soon found, moreover, that in the Kansas, Oklahoma, and Texas fields the helium gas occurs only in a certain group of geologic formations, and that in the strata above and below this group the helium content is very low. Another characteristic of the rich gas is its common occurrence at shallow depths—the best gas usually occurs above 600 or 800 feet, and gas in sands deeper than 1,600 feet is very poor in helium.

These three principles, once established, narrowed down the promising areas considerably and permitted intensive studies of the richest supplies. In some of the best fields practically every gas well was sampled, the samples being taken in small steel tubes, especially designed for the purpose, and sent immediately to the Bureau of Mines laboratory for analysis.

Possible sources outside of the Kansas-Oklahoma-Texas area were not neglected, however; many samples were collected in Ohio, Wyoming, Louisiana, Montana, California, and elsewhere, but only in Ohio were valuable supplies discovered.

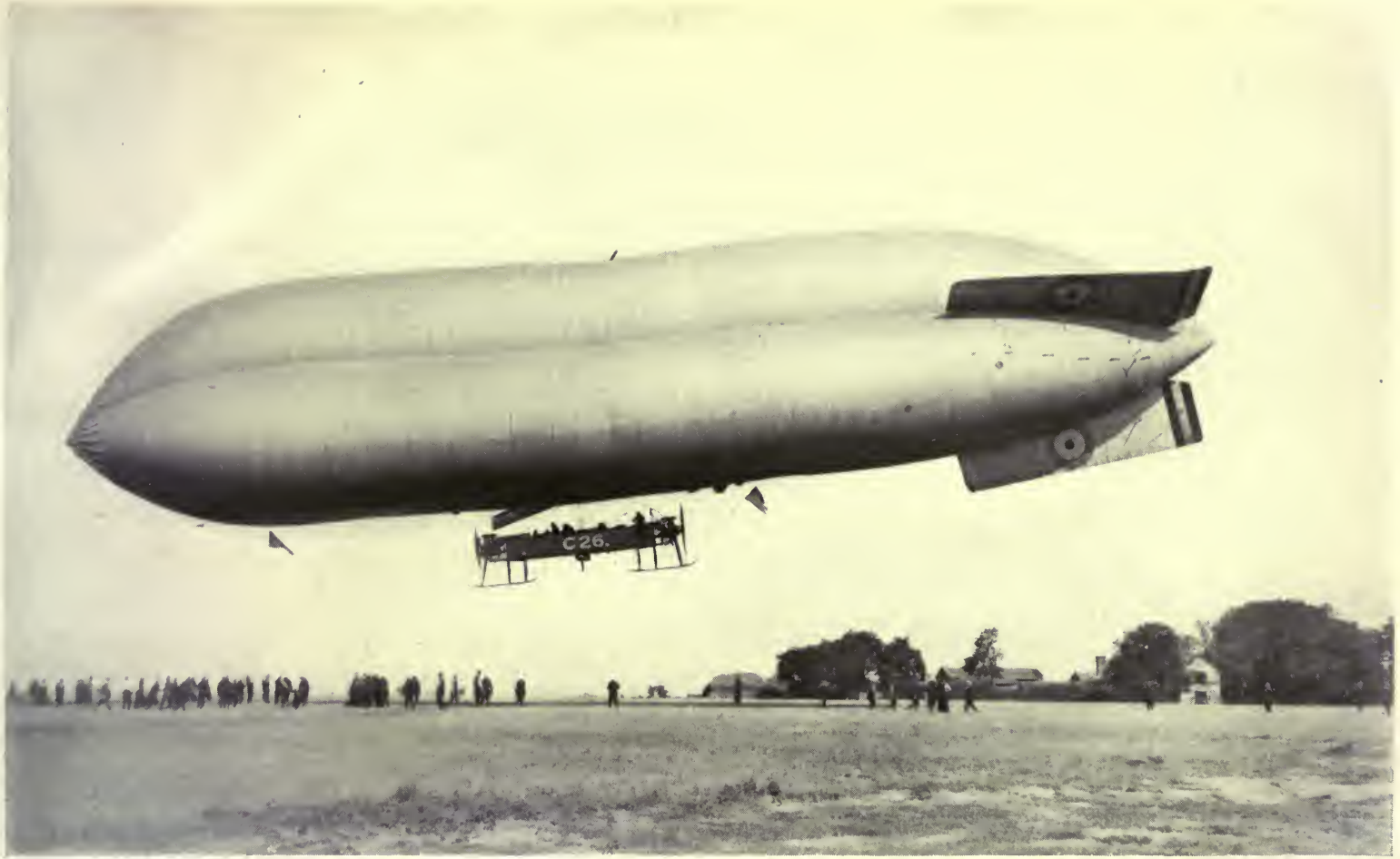
OUR LARGEST HELIUM FIELD

The largest of the helium gas fields is Petrolia, which is located on the flat prairies of northern Texas, about 100 miles north of Fort Worth. The gas here is found in sands from 1,400 to 1,600 feet deep and carries practically 1 per cent of helium, which is regarded as a good working proposition.

It is the Petrolia gas that is now being treated by the small experimental plants, and the Government has taken a ten-year lease on the helium output of the field and is now erecting plants capable of turning out at least 50,000 cubic feet a day.

At present there are about fifty gas wells in Petrolia, some of which originally produced as much as 30 or 40 million cubic feet of raw gas a day. When the field was first opened, about 1910, the gas issued under a pressure of 700 pounds per square inch, but the field has now seen its best days and the pressure has declined to less than 100 pounds.

Had the demand for helium come three years earlier, Petrolia alone could probably have furnished enough to satisfy the military program of the United States, but the production of the field has now fallen to a point where the helium content totals less than a million cubic feet



A COASTAL AIRSHIP IN THE HANDS OF A LANDING PARTY, SHOWING A GUN MOUNTED ON TOP OF THE ENVELOPE

Before the use of helium as the lifting gas of dirigibles, it was a dangerous practice to mount a gun on top of the bag for defense against airplane attacks. A single spark from the muzzle, touching and igniting the envelope and exploding its contents of hydrogen gas, would have been sufficient to reduce this mammoth flyer to a tangled heap of useless rubbish.

Official photograph, U. S. Naval Air Service

U. S. NAVY DIRIGIBLE C-1 READY TO START ON A 1,500-MILE FLIGHT FROM ROCKAWAY BEACH, LONG ISLAND, TO KEY WEST, FLORIDA

a week. When the first gas well was drilled at Petrolia, I estimate that the field contained slightly over a billion cubic feet of helium, which is a pretty respectable accumulation for a "rare element."

About 100 miles south of Petrolia lies the great oil and gas region in which the famous Ranger field is located. The gas in this district occurs in formations slightly older than the helium-rich strata farther north, and for this reason we had little hope that it would prove helium-bearing; but, needless to say, this inference was checked—and fully confirmed—by actual tests. I believe, however, if gas is discovered, as it probably will be, in the area southwest of Petrolia that it will prove to be of value for its helium content.

THE HELIUM-BEARING AREA OF KANSAS

The helium-bearing area of Kansas is far larger than any yet discovered in Texas and contains a number of fields which in the aggregate yields much more gas than Petrolia. Some of the Kansas gas, moreover, contains twice as much helium as the Petrolia gas, though on the average the Kansas variety is only slightly richer.

The Eldorado field—the richest oil field ever developed in Kansas, and one of the most prolific fields of high-grade oil in the world—yields gas which averages about 1¼ per cent of helium. This gas is found at a depth of 900 to 1,200 feet, or considerably above the rich oil sands.

A few miles to the south is the Augusta field, which yields two distinct varieties of gas—a "wind gas," practically incombustible, which occurs at 500 feet and carries about 2 per cent of helium, and a deeper gas which carries about half a per cent.

The gas resources of both these fields have fallen off considerably in the last few years, though the total helium content of their combined product is still nearly a million cubic feet per week.

The old Dexter field, in which the helium-bearing gas was first discovered, is now exhausted, though the early diffi-

VIEWS IN THE ELDORADO FIELD, KANSAS: ONE OF NATURE'S HELIUM STOREHOUSES

This is the richest oil field ever developed in Kansas, and it also produces gas slightly richer in helium than the gas found at Petrolia and now being used by the government.

Photographs from U. S. Geological Survey

A VIEW OF THE WELLS AT PETROLIA, TEXAS, THE LARGEST OF OUR HELIUM GAS FIELDS

Beneath these monotonous prairies is the greatest accumulation of helium known anywhere in the world.

culties in the way of burning the gas were overcome, and for years it was produced in large volumes and used as fuel.

HELIUM GAS THE BANE OF HOUSEWIVES

To light a gas stove in Dexter, however, was always a difficult feat, and it became a matter of pride on the part of every good housewife to develop the dexterity necessary to this operation. The stove was first filled with crumpled newspaper, which was set afire; then the gas was turned on, its flow being skillfully manipulated, until by the time the paper had burned out the gas had become hot enough to take fire.

About 7,000 cubic feet of this gas was necessary to produce the heat of 1,000 cubic feet of the ordinary variety, however, and we who think of gas at a dollar a thousand will pray that no such variety is discovered in our own neighborhoods.

Although the old Dexter field is exhausted, there is favorable territory in the vicinity in which further supplies may be discovered, and about 20 miles eastward lies the Sedan field, which produces gas carrying over 1 per cent of helium. At present the actual production of this field is small, but this is chiefly because there is little market for the gas on account of its poor heating qualities. With proper development, this area may become the most prolific of all.

The Geological Survey is preparing to issue a detailed report on the helium-bearing gas fields and a further description of them here would be tedious.

The only promising source of supply outside of the mid-continent area is located in Vinton County, Ohio, about 80 miles south of Columbus. This gas occurs in strata considerably older than those in the Kansas and Texas areas and contains only a third of a per cent of helium; but, on the other hand, there is an enormous quantity available and it is under high pressure. Whether it could be worked at a profit by the present methods is doubtful; but if the new extraction process materializes, it should make this great supply available as a commercial source of helium.

The gases of Louisiana, Wyoming, Montana, and California occur in strata that are much younger than those of the mid-continent area, and I think there is little prospect of locating a helium supply in those States.

The fields already described, however, are capable of producing, if necessary, a quarter of a billion cubic feet of helium a year for the next three years, and there is an excellent chance that further supplies will be discovered in northern Texas, northern Oklahoma, and southern Kansas.

NO OTHER COUNTRIES HAVE DISCOVERED RICH HELIUM RESOURCES

So far as we know, no other countries have any commercial supplies of helium, though it would, of course, be foolish to state that none will ever be discovered. Great Britain, however, was thoroughly searched for helium gases during the war without success.

In France there are some mineral springs which emit gas rich in helium, but the total volume per year is insignificant. Far larger volumes of helium are contained in the "fire-damp" of French and Belgium coal mines, but the proportions are so small that there is little hope of extracting the helium commercially.

The return of Alsace puts France in possession of an oil field in which some gas is produced, but the normal variety contains only a trace of helium. A deep test-hole near Pechelbronn, however, found in the older formations a little gas which carries 0.4 per cent.

In Italy some gas is produced on the northern flank of the Apennines, but two analyses of this gas showed only very minute quantities of helium.

Germany produces a little gas near Hamburg, but the helium content is only 0.014 per cent, and the Austrian gas produced near Wels contains even less.

The only gas field in Europe which compares in size with our American fields is located in Transylvania, and several analyses of this gas show less than 0.002 per cent helium. The Roumanian and Galician oil fields on the Carpathian front yield very little gas, and the Baku fields of Russia are also primarily oil producers.

Some gas has been found in Russia, near Samara, which carries considerable nitrogen, and may possibly be helium-

bearing, but there is not much likelihood of its becoming a commercial source.

HOW DOES HELIUM GAS HAPPEN?

It is a pity that the story of helium cannot be closed with a theory explaining its origin and occurrence, but no satisfactory theory has yet been suggested. Geologists believe that natural gas itself is a product of the decay of the vegetable and animal remains buried in the rocks; but, as helium is found also in mineral spring and volcanic gases, this seems to have no special significance.

Some believe that the helium has arisen from great depths in the earth and has simply mingled with whatever gases it happened to meet, but the largest volumes of helium are found in regions remote from any known fissures through which the gas could ascend, and, furthermore, it is difficult to understand why the helium should rise almost to the surface and there remain.

There is, of course, an enormous volume, in the aggregate, of helium in the atmosphere (where it is about as valuable as the gold in sea-water), but there is no good reason to suppose that the helium in natural gas has been absorbed from that source.

THE RADIUM THEORY

There is a third possibility, more attractive and fascinating, perhaps, than the other two, namely, that helium is derived from radium.

Every one now knows the wonderful qualities of radium—its property of giving off heat enough to burn the flesh if a tiny grain of radium is placed on it; its faculty of being luminous in the dark, and so on. Radium is ordinarily considered one of the chemical elements, but its discovery upset all the old notions about the permanency and indivisibility of the elements; for the extraordinary properties of radium are due to the fact that it is continually breaking down, at a slow, but constant, rate, into other substances.

One of these substances is a gas called radium emanation, and this in turn breaks down into another body, called Radium A, and so on through a whole chain of similar substances until it finally becomes the unromantic element which we call lead.

This is only half the story, however, for when radium breaks down into the emanation, the other substance formed is helium, and as each one of the other radio-elements disintegrates it also generates helium. It is curious to reflect that these changes are constantly proceeding, even in the minute quantities of radium in the luminous dials of our watches, and that under our watch crystals infinitesimal volumes of helium are being generated hourly.

RADIUM WIDELY DISSEMINATED

As the world's total output of refined and purified radium amounts to only four or five ounces, valued at over three million dollars an ounce, it may well be asked how so rare and precious a substance can be called upon to explain the vast accumulations of helium in natural gas.

As a matter of fact, however, although deposits of radium ore rich enough to mine are few, the element itself is widely disseminated through ordinary rocks. The quantities are so exceedingly minute that were it not for the great activity of radium, it could never be detected; but by the use of an instrument known as the electroscope, incomparably more delicate than the finest assayers' balance, the presence of only a few trillionths of 1 per cent of radium in a rock may easily be determined.

The amount of radium in a pound of rock or in a ton is utterly insignificant, but the total quantity in a cubic mile is enough to generate, according to a calculation of mine, about half a cubic foot of helium a year. This, too, sounds small; but multiply the cubic mile by a few thousand and the year by a few million and the total volume of helium begins to assume formidable proportions.

There is really little doubt but what there is enough radium scattered through the earth's crust to account for all the helium we know of, though whether the helium actually *did* originate in this way is a matter concerning which scientists disagree.

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THE MILLENNIAL CITY

The Romance of Geneva, Capital of The League of Nations

By Ralph A. Graves

Author of "Fearful Famines of the Past," "Ships for the Seven Seas," etc.

WHETHER the League of Nations prove a will-o'-the-wisp, leading peoples into a morass of war-breeding misunderstandings, or the beacon guiding them into the paths of perpetual peace, Geneva, its capital, will be known henceforth as the Millennial City. If the League succeeds, the Swiss municipality will become the city set on a hill, the center of man's moral universe.

Viscount Bryce has said that there are four cities that belong to all men rather than to any one nation—cities that have influenced the whole world, or round which its history has at one time or another revolved; cities in which students and philosophers from every country are equally interested. To these four—Jerusalem, Athens, Rome, and Constantinople—must now be added Geneva.

Jerusalem gave to western civilization its religion. Athens was our great preceptress in liberty, literature, and art. Rome was the mother who gave us our laws and to most of us our language, while the power of her political and ecclesiastical institutions still sways half the globe. Constantinople, after the sacking of Rome, became the preserver of civilization, was the birthplace of the Justinian Code, the seat of an empire for fifteen hundred years, and the link between the waning glories of the Orient and the growing splendors of the Occident. Geneva now becomes the fountain-head of what may be either the most noble triumph or the most colossal failure in the history of human endeavor.

A HALF-WAY HOUSE BETWEEN BELLIGERENTS DURING THE WAR

Seated serenely on both banks of the River Rhone, where it leaves the limpid waters of Lake Geneva as a placid stream, in contrast to the muddy turbulence of its ingress at the other end of the lake, Geneva is not the metropolis of the miniature Republic of Switzerland, for Zurich surpasses it in population by 50 per cent and Bern is the capital. But it is doubtful whether before the world war any other city of its size was visited annually by as many tourists, for it was the main gateway into the world-famous "playground of Europe."

During the European conflict many of the finest Swiss hotels, which in seasons past have entertained thousands of Americans, suffered greatly for lack of wealthy patronage, and the federal government found it advisable to come to their financial relief by passing an ordinance

GENEVA, ASTRIDE THE RIVER RHONE, WHERE IT ISSUES FROM THE SLEEPING WATERS OF THE CRYSTAL LAKE

"Here dwelt the wise and wondrous," encircled by mountains whose heights and everchanging hues are constantly mirrored in the placid waters that lave its shores. Chosen as the permanent seat of the League of Nations, the physical aspects of the modern Swiss city are no less fascinating than the panorama of its historic background. This view of Geneva shows the Coulouvrenière Bridge and a flotilla of laundry boats anchored in the Rhone with linen hung out to dry on the decks.

extending the time for payment of interest on mortgages.

Other hostelries, however, were as crowded during the four years of horror and bloodshed as are the fashionable caravansaries of New York during Horse Show and Automobile Show weeks. But it was a kind of patronage different from any to which Geneva had catered since the days of the Reformation. Refugees from the belligerent countries flocked here, and thousands of interned soldiers were fed and housed by the government at a contract price, the country to which the soldier belonged reimbursing the Swiss.

Here, too, assembled the propagandists of every creed and complexion. Geneva, and in fact all Switzerland, fairly seethed with plot and counterplot, as agents and spies trafficked in military secrets and in the honor of foreign public officials. Here the nascent nations of middle Europe organized their bureaus of publicity and sent forth their pleas for recognition. Thus the Republic became the busy half-way house between the belligerent forces.

THE SORROWS AND GLORIES OF GENEVA'S PAST

Although its recorded history goes back beyond the Christian era, to the time when Julius Cæsar, in his commentaries on his first expedition into Gaul, mentions it as a stronghold of the Allobroges, its growth has been phenomenal only in its leisureliness. Today, after twenty centuries, it has less than one-third the population of the century-old capital of the United States.

But size has never been an infallible criterion by which to appraise influence. In the days of Pericles, the period of her greatest glory, Athens could boast of only 50,000 freemen—scarcely more than would have filled the stadium of Herodes Atticus, laid out by Lycurgus in the succeeding century!

Coupled with the heroism of the struggle of the Genevese against the Dukes of Savoy to secure political independence was the noble humanitarianism which prompted its inhabitants to accord shelter and succor to the fugitives from the shambles of the St. Bartholomew massacres in France and the persecutions during that era in England.

The city enjoys the distinction of being the birthplace of the International Red Cross, but also has some dark chapters in its past—the religious excesses of the Reformation, when the persecuted became the persecutors.

With such historic events must be associated the names of native sons, visitors, and exiles whose lives have added luster to the city and romance to its story. Rousseau, of whom Napoleon said, "Without him, France would not have had her Revolution"; and the patriot Bonivard, whose trials Byron immortalized as the Prisoner of Chillon, were Genevans. Farel, the Billy Sunday of his day, who could not be made to desist from preaching, even though the women of his congregation dragged him up and down the aisles of the church by his beard, made the lake city his headquarters during his ascendancy. And John Calvin, "who found Geneva a bear garden and left it a docile school of piety," was virtual dictator here for a quarter of a century.

Here, too, came Voltaire, who, as an exile from the court of Frederick the Great and from his own France, found it "very pleasant to live in a country where rulers borrow your carriage to come to dine with you." John Knox, the Scotch reformer, described this, his city of refuge, as "the place where I fear nor ashame to say is the most perfect school of Christ that ever was on the earth since the days of the Apostles"; but Madame de Staël, even amid the luxury of her Coppet estate, could not be reconciled to her banishment from Paris, as she gazed upon the sublimest glaciers of the Swiss Alps and sighed for "a sight of the gutters of the Rue du Bac." Byron and Shelley spent the fruitful summer of 1816 in adjoining villas in the outskirts.

A PHANTOM PROCESSION OF THE GREAT

Such are the people of Geneva's past—some gay, but most grave—with whom we can promenade arm in arm in phantom procession through the beautiful Jardin Anglais; along quays from which we glimpse the gleaming radiance of Mont Blanc; beneath the magnificent monument erected to the memory of

© Donald McLeish

THE CASTLE ON LAKE GENEVA WHERE THE PRISONER OF CHILLON WAS CONFINED FOR SIX YEARS

After his release from the dungeon of this castle, François de Bonivard, the original of Byron's "Prisoner of Chillon," was commissioned to write a history of Geneva. His style was more forceful than elegant. For example, in speaking of the manner in which the city was hemmed in by its enemies, he wrote: "One could scarcely spit over the walls without spitting on the Duke of Savoy," and "As the glutton likes a good plump fowl, so the Duke likes Geneva." He likened some of his timorous fellow-patriots to "those who want to catch the fish without getting their feet wet."

Duke Charles of Brunswick, who bequeathed 20,000,000 francs to the city he loved so well; through the narrow, step-like streets of the old town up to the eleventh century cathedral, and to the portals of the famous Hotel de Ville, within the shadow of whose walls Servetus heard pronounced the sentence of death at the stake.

It is a poor European city that cannot trace its origin back to the age of myth and mythology. It took Geneva a long time to extend its family tree to Hellenic days, but traditionists now declare that four centuries ago there was discovered in the castle of Chillon a document which makes the lake city a contender with Rome for antiquity.

It will be remembered that the Eternal City was founded by the descendants of Æneas and his followers, who escaped from the Greeks after the fall of Troy. Geneva, which under Calvin's régime was to acquire the appellation, the "Protestant Rome," likewise turns to Troy for its traditional founder — Lemanus, son of Paris, whose abduction of the fair Helen from the palace of Menelaus brought on the Trojan war. And, to prove their case, Genevan guide-books point to their lake, *Leman* (from the old Latin name for Lake Geneva, revived in the eighteenth century), named in honor of their mythical progenitor.

Leaving the realm of fiction and tradition, the settlement at the southwestern extremity of the Alpine lake remained under the domination of Rome from the time of Cæsar until the break-up of the empire. In that period of five centuries it was twice razed—once by the Ostrogoths and once by Attila and his Huns.

A MARINE BUTTERFLY ASAIL IN THE SHADOW OF THE SWISS ALPS

The advent of many commodious saloon steamers on Lake Geneva has not banished entirely these picturesque craft with their lateen sails of red. The first steamer to ply the waters of the lake was the *Guillaume Tell,* built in Geneva by an Englishman 96 years ago.

THE GENEVA LIGHTHOUSE

The level of the waters of Lake Geneva is subject to curious fluctuations, known as *seiches*. During these disturbances the whole mass of water in the lake swings rhythmically from shore to shore. A seiche has been known to cause a fluctuation of six feet in the level of the water at Geneva. One explanation advanced for this phenomenon is the sudden variation in atmospheric pressure on the surface of the lake.

In 800, together with the rest of the territory now embraced in Switzerland, it was an integral part of Charlemagne's dominions. Then for six centuries the city's history presents no points of compelling interest, the chief events being a succession of struggles between the prince-bishops and the counts of Genevois and Savoy for ascendancy.

A CITY OF GAYETY

In spite of political turmoil within and the constant danger of attack from without, this was an era of gayety in Geneva. Every one took life lightly. In the evenings, behind locked gates of the land fortifications and with the lake front protected by a row of stakes interwoven with heavy chains, the Genevese made the narrow streets their drawing-rooms. Beneath the flare of flambeaux they held high carnival, the women of exalted degree mingling with the common folk and dancing in the open with the gallants of the day.

The fact that during the day these streets were filled with lepers and beggars did not oppress the revelers. Nor was the cost of living high, if we are to accept the testimony of travelers, in whose diaries we find the entry that entertainment could be had at such inns as the Good Vinegar, the Hot Knife, or the Crowned Ox for man and beast at five pence a day!

THE SWISS CONFEDERACY A FRIEND IN NEED

Geneva probably would have been absorbed into the possessions of the Italian House of Savoy at this period in her history had it not been for the assistance from time to time of the cities of the Swiss Confederacy. In the fifteenth century Fribourg, a prosperous cloth manufacturing community, formed a commercial alliance with the Genevese, whose fairs were famous throughout western Europe.

This alliance aroused the ire of the reigning Duke of Savoy, who was the father-in-law of Louis XI of France. He induced that sovereign to forbid French merchants to attend the Geneva fairs, and at the same time to change the time for holding the rival Lyons fairs, so that they would conflict with those of the lake city. This was a serious blow and very nearly effected the commercial ruin of the Genevese.

During the first quarter of the sixteenth century, after the Reformation had gained full headway in middle Europe, a staunch Geneva patriot, Philibert Berthelier, succeeded in concluding a defensive alliance with Fribourg against Savoy, but not without bitter opposition from a strong ducal party in Geneva itself. The city was divided into two hostile factions—the Mamelukes, adherents of the Duke, and the Eidgenossen, or partisans of the Swiss Confederacy. It is interesting to note that from this term Eidgenossen (literally, oath companions) is supposed to have been derived the word Huguenot, subsequently applied to the French Protestants of the sixteenth and seventeenth centuries.

THE PRISONER OF CHILLON

One of the most picturesque figures in the history of Geneva during this period was Berthelier's associate in arms, François de Bonivard, who, when his victorious friends rushed into his dungeon at Chillon crying, "Bonivard, you are free!" responded with the query, "And Geneva?" Upon being assured that his city was also saved, he went home rejoicing.

Bonivard was a man of many contradictions. In inn and tavern he plotted revolution with compatriots who styled themselves the Children of Geneva. He engaged in armed strife for the possession of the priory of Saint Victor, and waged guerrilla warfare against a band of young "bloods" of Savoy, who called themselves Knights of the Spoon because they wore about their necks spoons with which to "eat" Geneva when they should capture it.

He bore with sangfroid his six years' imprisonment in the Castle of Chillon, four of which were spent in the dungeon beneath the level of the lake, chained to a pillar so that he could walk only three steps back and forth. He defended himself against the charge of beating one of his four successive wives by proving that "she needed it," thereby causing the reproof of the council to be shifted from his shoulders to hers, and in a subsequent domestic tragedy played a chivalric rôle

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THE TOWER OF THE CATHEDRAL OF ST. PIERRE AND THE HOUSE IN WHICH JOHN KNOX, THE SCOTCH REFORMER, RESIDED DURING HIS SOJOURN IN GENEVA IN THE SIXTEENTH CENTURY

The cathedral, which crowns the highest point in the old section of the city, is a Romanesque structure, said to have been erected during the first half of the eleventh century and rebuilt in the twelfth and thirteenth centuries. One of its treasured relics is a chair under the pulpit, which is said to have belonged to Calvin.

worthy of one of the Arthurian knights. Such was the stormy career of this Genevan.

THE LAST TRAGIC EPISODE

The story of the last grim episode in his life deserves to be told.

Having reached the age of nearly threescore and ten, and while still engaged in his literary pursuits, one of his works being his "Chroniques de Geneve," which he was commissioned to write by the City Fathers, Bonivard took into his house a young woman who had fled to him for protection.

The kindly act scandalized the proprieties of the religious community and he was called upon to marry the girl. All arguments that his relations with his ward were of a Platonic nature, and that he was old enough to be her grandfather, were of no avail. The marriage was solemnized.

In a short time Bonivard's worst fears were realized. This fourth wife, weary of her septuagenarian spouse, became involved in a love affair and the guilty pair were haled to trial.

Bonivard, who had not lodged the complaint, loyally testified in his wife's behalf, declaring that he did not believe the charges, and that she had always been a dutiful helpmate, his only cause for complaint being (and here we may assume that the veteran was adroitly pleading his wife's cause with the intense religionists who were her judges) that she had nagged him for his remissness in preaching the gospel and had beaten him for inviting friends to his house to drink wine.

It was a noble effort, but the evidence against the young wife was overwhelming. Her lover was decapitated and she, after the practice of the age, was sewn in a sack and thrown into the Rhone.

HOW CALVIN CAME TO GENEVA

Mention has been made of Guillaume Farel, the intrepid zealot whose missionary work, extending over a period of nine years, was responsible in a large measure for Geneva's definite adoption of the Protestant faith in 1535. But his influence did not end here.

By one of those curious chances upon which hinge events of monumental moment, the young French philosopher, John Calvin, a native of Picardy, passed through Geneva one evening on his way to Strassburg. He had intended spending only one night; but Farel, hearing of his arrival, rushed to him and, with the fiery impetuosity which characterized every act of his life, convinced Calvin that it was his duty to remain and assist in the organization of a theocratic State.

Both men were soon driven from the city because they refused to officiate at a communion service for their "godless flock"; but upon his recall several years later, Calvin, who was then only 32 years of age, laid the foundation for a government which in its rigorous supervision of the private lives of the people has seldom, if ever, been equaled. Geneva became known as the City of Calvin as well as the Protestant Rome. Every act of the individual was under the scrutiny of the Council, of which Calvin was the moving spirit.

A CODE WHICH TOOK THE JOY OUT OF LIFE

The austerity of the Calvin code presents many amusing phases to the modern reader. For example, a hairdresser was imprisoned because he made one of his clients too beautiful. Any man who swore "without necessity" was required to take off his hat, "kneel down in the place of his offense, clasp his hands, and kiss the earth." The wearing of silk or embroidered hose was prohibited; likewise the adornment of one's person with chains of silver or gold, and eating or drinking in taverns outside of the city. Hosts and hostesses were enjoined to warn their guests to be in their own lodgings "after the trumpet sound to the watch or the ringing of the bell" (nine o'clock at night).

The penalties inflicted for wrong-doing under this hierarchy were of varying severity. The punishment meted out to Bonivard's wife has been related. In the case of Clement Marot, the famous French poet, who made the first metrical version of the Psalms and wielded tremendous influence upon Protestant thought in France, tradition says that the offender was whipped about the streets of the city upon complaint of an innkeeper, who had learned that his distin-

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ON HER WAY TO THE ALPS

At the end of the summer this Alpine beauty may be chosen to lead the herd back to the valley. The best cow is privileged to wear the statue of the Blessed Virgin, wreathed in flowers, between her horns, and, with head held high, wearing the biggest and deepest-toned bell suspended from her neck, she proudly steps out at the head of the procession of returning cattle.

guished guest had made love to the accuser's wife. This bit of gallantry on the part of Marot had been prompted by a spirit of retaliation for his host's insistence that the poet ask a blessing before every meal.

Of course, the indelible blot upon this period of Geneva's history and upon the careers of her men of authority was the infliction of the death penalty upon heretics. The two most notable martyrs were Jacques Gruet and Michael Servetus.

The former, convicted of having an heretical document in his possession, was subjected to the torture of the *corde*. The victim's wrists were bound tightly behind him with a cord, to which was then attached a rope thrown over a pulley, and by this means the sufferer was suspended in the air. Gruet underwent this intermittent torture for three weeks before "confessing." When he finally admitted his heresy he was taken to Champel, about two miles from the town hall, and there put to death.

Dr. Servetus, an eminent Spanish physician, while on a visit to Geneva, was burned at the stake following a doctrinal controversy with Calvin.

But the blackness of such tragedies was mitigated, in so far as such crimes can be atoned, by the generosity and solicitude of the Genevese for the persecuted of their own faith who took refuge here from many lands.

OPEN ARMS FOR HUGUENOT FUGITIVES

There is no more beautiful picture of Christian charity than the scene in this city when, on August 30, 1572, merchants of Lyons brought news of the massacre of the Huguenots on St. Bartholomew's Day. Pastors were dispatched to the frontiers to meet the fugitives who were reported to be on their way to this asylum, and the venerable Theodore de Bèze, who had succeeded Calvin as the spiritual head of the Council, directed the whole population to fast and pray for the sufferers.

Two days after the receipt of the news of the massacre the first fugitives began to arrive. In all, more than 2,300 refugees were housed and fed in this community, which at that time boasted of only 1,200 households. Although almost bankrupt herself, Geneva shared her all with the panic-stricken hundreds who arrived empty-handed.

A final episode remains to be related of the period antedating the advent of Rousseau. For a quarter of a century, beginning in 1578, the Genevese had succeeded in resisting the revived attacks of their hereditary enemy, the House of Savoy. At last the Council, after resolving "to ask the advice of God and M. de Bèze," declared war.

The citizen army numbered scarcely more than 2,000, as opposed to 18,000 Savoyards. Many Hun-like atrocities were committed. One prisoner is said to have been skinned alive, and peasants were hung up and roasted before their own fireplaces. The Genevese attempted to retaliate, but de Bèze, actuated by a spirit far in advance of his age, convinced them that by such acts they would be dishonoring their own city.

THE NIGHT OF THE ESCALADE

The closing act in the long drama occurred on the night of December 11, 1602, when the Duke's men, under General d'Albigni, made a treacherous assault upon the city.

There were 4,000 troops comprising the main body of d'Albigni's forces. These were preceded by a storming party of 200, which succeeded in gaining the ramparts unobserved, a single sentry being surprised and slain in silence. Unfortunately for the assailants, however, they decided to await the coming of dawn before launching the main attack. In the meantime a company of the Genevese guard stumbled upon the storming party.

In the mêlée a gun went off and one man of the guard, the drummer, escaped. He sounded the alarm.

It was now impossible to wait for daylight. The storming party gave their battle-cry and hurled themselves upon the town, expecting d'Albigni's 4,000 men to follow immediately; but the drummer's work had been done. An intrepid band of defenders at the Porte Neuve loaded a cannon to the muzzle with scraps of metal and old chains. Training the piece along the ramparts, the charge swept the

© Paul Thompson

IMPROVING MUSCLES AND MAINTAINING MORALE AMONG THE MEN OF SWITZERLAND'S NATIONAL MILITIA

Service in the militia is compulsory and universal among the Swiss, with few exemptions, except for physical disability. Those who are excused or are rejected pay additional taxes. Liability for military service extends from the 20th through the 48th year. The men from 20 to 32 years comprise the *Ausgus,* or "Élite," corps of the militia.

moat, destroying the ladders of the scaling party, and the city was saved.

The Duke of Savoy, who had been given a premature report of the success of this venture and had dispatched couriers to various courts of Europe announcing the gratifying results of his enterprise, upon receiving a true version of his ignominious rout, shouted at d'Albigni, "You blockhead, you have made a pretty mess of things!" Then he put spurs to his horse and rode for Turin, without thought of the fate of his defeated army.

To this day the Genevese gather at their cathedral on every anniversary of the Escalade, as this battle is called, and sing the 124th Psalm, the one which the venerable de Bèze bade them sing on the morning after the night of their deliverance: "If it had not been the Lord who was on our side, when men rose up against us . . ."

The story of Jean Jacques Rousseau, who delighted to style himself "the citizen of Geneva," although he did not take up his residence in the city of his birth until he was more than 40 years of age, is too familiar to warrant recital here. He is a careless tourist, however, who fails to make a pilgrimage to the little house at No. 40 Grand' Rue, where this son of a watchmaker and dancing master was born, or who does not linger over the balustrade of the beautiful Pont du Mont Blanc and look down upon Rousseau's Island and its Pradier bronze of the famous philosopher and people's advocate.

THE PARADOXICAL ROUSSEAU

Perhaps even more paradoxical than Bonivard's were the career and the character of this Genevan immortal. McCrackan has summed up his contradictions thus: "Although by temperament

A SWISS COWHERD IN NATIVE COSTUME

In each hand he holds an embroidered yoke and a huge bell. These are to be awarded the prize animals of his herd. Note his decorated pipe, which is an essential accessory of the holiday regalia.

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ALMOST A TRAGEDY: ON THE FACE OF A DANGEROUS ICE SLOPE IN THE ALPS

Among Geneva's many handsome quays, the most famous is the Quai du Mont-Blanc, from which a superb view of the majestic Mont Blanc group of mountains, to the southeast, across the lake, is obtained. The summit of Mont Blanc was reached for the first time on August 8, 1786, by Jacques Balmat, a chamois hunter of Chamonix, who had been spurred to the undertaking by a large reward offered by the famous Geneva naturalist, De Saussure. The elder Dumas, interviewing Balmat nearly 50 years after the event, quotes the mountain-climber as describing his sensations upon achieving the summit: "I was the king of Mont Blanc; I was the statue of that immense pedestal."

Photograph by A. G. Wehrli

UPWARD HO FOR THE HAY MARKET! THE GRASS HARVEST OF THE VALLEY STARTING FOR THE SWISS HEIGHTS

It is estimated that Switzerland has more than 300,000 peasant proprietors out of a total urban and rural population of less than 4,000,000. More than a third of the productive area of the country is under grass and meadows. The chief agricultural industries are the manufacture of cheese and condensed milk.

gross and sensual, he described the utmost delicacy and refinement of love in his 'Nouvelle Heloise'; he who abandoned his illegitimate children to the Foundlings' Hospital was a radical reformer in the education of the young; a mediocre musician, playwright, and poet, but an original and courageous philosopher; incapable as a political leader, but unrivaled as an advocate of popular rights."

A PILGRIMAGE TO VOLTAIRE'S VILLA

Nor does the twentieth century visitor to Geneva neglect a morning's walk to Ferney, where Voltaire spent his declining years. Both he and Rousseau took up their residence in Geneva in the same year (1754), and in death they rest side by side in the Pantheon in Paris; but it cannot be said that they dwelt in mutual amity. The great scoffer's plays, staged in the vicinity of Geneva, were the occasion of a bitter war between the exiled cynic and the vituperative citizen.

The inscription in the chapel at Ferney, "Deo erexit Voltaire," never fails to provoke from the guide the elder Dumas' ironic explanation of it: "It was erected to prove to the whole world, which had

Photograph by Edgar K. Frank

YOUNG SWITZERLAND AT A DRINKING FOUNTAIN

While the mountain republic revels in the sobriquet, "The Playground of Europe," it could also with much truth lay claim to the title of "a school-room for the continent and England," for its institutions of learning are widely known. Of its seven universities, that of Geneva, founded by Calvin in 1559 and generally recognized as one of his greatest gifts to the city, is the most famous, although that of Basel is a century older.

become very anxious about the disputes of the creature with his Creator, that Voltaire and God had finally become reconciled; the world heard the news with satisfaction, but it always suspected that Voltaire had made the first advances."

A mile or two farther along the northern shore of the lake brings the traveler to Coppet, where Madame de Staël held her brilliant court, surrounded by such satellites as the beautiful Madame Récamier, Guizot, the French historian, and Sismondi, the Swiss chronicler; Madame Le Brun, the noted artist, and Cuvier, the French naturalist. Yet, with all her wealth and her brilliant coterie of worshipers, who revolved around her as their sun, from which they derived their intellectual light and emotional warmth, she was unhappy, holding that a day of Paris was better than a decade of exile, even though that exile be softened by every material comfort and scenic charm.

THE HOME OF THE RED CROSS

The world recognizes Geneva as the maternal city of the International Red Cross. Not only did her citizen philanthropist, Henri Dunant, arouse the world with his book, "Un Souvenir de Solferino," in which he described the sufferings of those left on the field after that terrible battle in 1859, but it was to this city that the two famous conventions of 1864 and 1906 were called to deal with the problems of aid to the wounded and to noncombatants. In the latter year the representatives of 35 nations met and agreed upon the articles under which the Red Cross now operates throughout the world.

So, delegates from every clime and of every political creed, representing the League of Nations, will not be strangers

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A SWISS MISS AND HER PLAYMATE

Her ancestors fought "the small battles of immortal memory"; she, her parents, and her descendants are to be hosts to the League of Nations. The Swiss Confederation, which students of history characterize as "a well-nigh perfect union," suggests in its make-up the possibilities for success of the new venture upon which the free nations of the world are entering. Its "twenty-five small States, differing from each other in nearly every point—religious, political, social, industrial, physical, and linguistic—are so organized as to constitute a federation which maintains public welfare, individual rights, and general harmony" (see "The Races of Europe," in THE GEOGRAPHIC for December, 1918).

Photograph courtesy Emile Fontanel

THE PEACE DELEGATES OF TWENTY-SEVEN NATIONS HAVE CHOSEN THIS CITY AS THE CAPITAL OF THE WORLD

In the distance looms the majestic summit of snow-clad Mt. Blanc. The fronded islet in midstream is dedicated to the memory of Geneva's most famous private citizen, Jean Jacques Rousseau, whose bronze statue by Pradier may be indistinctly seen through the foliage. A wooded park on the shores of the lake, five miles from the center of Geneva, has been selected as the site for the permanent home of the League of Nations. A mile below this point the Rhone is joined by the Arve, the clear blue waters of the former and the muddy, glacier-fed waters of the latter flowing side by side for a distance of several hundred yards before they mingle.

to the Millennial City, nor the city to them.

GENEVA IS FRENCH IN LANGUAGE AND CUSTOMS

Of the 25 Swiss cantons, the German language is spoken by a majority of the inhabitants in 19; but Geneva is one of the five where French is not only the popular language, but French customs and French habits of thought prevail. In the remaining canton Italian is the dominant tongue.

Geneva Canton is not naturally productive, but the frugal industry of its people causes it to yield a very respectable harvest of fruits, grain, wines, and vegetables. In extent, the canton measures 108 square miles, compared with the 70 square miles comprising our District of Columbia. Four-fifths of this area is cultivated—a far higher average than obtains throughout Switzerland, as indicated by the fact that before the war the little republic depended upon the outside world for five-sixths of all its wheat and a fourth of its meat.

From a material and physical standpoint, Geneva will make an ideal world capital. Its industrial activities are considerable, yet neither noisy nor sordid. Famous for its watches, the manufacture of which was introduced by Charles Cusin, of Autun, in 1587, it is also the home of the music-box.

Industrial statistics, which show that there are more than five hundred factories in the Canton of Geneva, convey a wrong impression to an American, for under the Swiss system of classification every workshop, even though it employ only two or three people, is called a factory. In these numerous small establishments chocolate, preserved fruits, synthetic perfumery, cigars and cigarettes, parts of watches, and jewelry are made.

The manufacture of watches, especially the wrist-watch type, condensed milk, and chocolate flourished during the war, and many a Genevan would have amassed a large fortune had it not been for the fact that the cost of materials as well as the cost of living increased from 100 to 300 per cent. In the manufacture of chocolate, the Swiss were greatly handicapped by the fact that their normal sources of raw materials were Africa and South America.

As typical of the minutiæ of Switzerland's manufacturing industries, it is the boast of one important firm that it conducts an international trade in the sale of the small bows which are attached to leather bands inside our hats.

HANDICAPPED BY DEARTH OF COAL

Heavy manufacturing establishments have never found a home in Geneva, as Switzerland lacks mineral resources, especially coal. More than half a century ago coal was mined in the adjoining canton of Valais, but the industry was abandoned owing to the inferior quality of the output. During the war, however, when the price of fuel mounted to unheard-of heights, even necessitating radical curtailment of the State-operated transportation facilities, this Valais mine was reopened.

Though poor in coal, Geneva and her sister cities have a wealth of water power, and it is highly probable that the republic will electrify its 3,700 miles of State-owned railways in the near future.

One practice which will seem strange to most of the representatives of the League of Nations will be the 24-hour clock, which the Swiss Federal Council last year decreed should be adopted upon the return of normal conditions.

The 24-hour system of time-keeping, beginning at the midnight hour, has been in use by astronomers and in one or two European countries for a number of years, but it is unfamiliar to the western lay world. According to these regulations, the Swiss transportation system, telegraph lines, customs service, and all institutions under Federal control will be operated by the new-style timepiece, one o'clock in the afternoon being designated as the thirteenth hour, etc.

THE SITE FOR THE LEAGUE'S PERMANENT HOME

Geneva has set aside as a site for the permanent home of the League of Nations a beautiful wooded park bordering on the lake some five miles from the center of the city. Behind the park tower the snow-clad Jura Mountains. While there are many villages in the vicinity of

the park which are suitable for offices and for quarters of the delegates and their secretarial staffs, the capitol building itself must be built.

Thus every external attribute conducive to comfort and pleasure will be provided for the statesmen whom it is proposed to commission with the responsibility for international justice, liberty, and world peace.

The aspect of Lake Geneva from this site will prove a constant source of delight to the visitor, its brilliant blue waters in calm weather reflecting at dawn and eventide the indescribable alpenglow of the mountains to the south, while the lateen sails of barge and pleasure craft present a perpetually changing picture, as if staged anew each moment for every spectator.

While here and there among the literary estimates and appreciations of its beauties one finds a somewhat critical note, as that of William Dean Howells, who only saw in the city "an admirable illustration printed in colors for a holiday number to imitate a water-color sketch," an overwhelming majority of those who have enjoyed Geneva's hospitality will lean rather to Ruskin's estimate, that it is "a bird's nest of a place; the most lovely spot and the most notable, without any possible dispute, of the European universe."

DEVIL-FISHING IN THE GULF STREAM

By John Oliver La Gorce

Author of "Pennsylvania, the Industrial Titan of America," "Warfare on Our Eastern Coast"

WHAT the rolling prairie of the Far West was to the buffalo in the olden days, when it roamed in countless thousands to and fro in search of new pastures and salt, the ever-rolling Gulf Stream—that mighty, warm river which parallels the east coast of Florida—is to the fish legions of our semi-tropical seas.

How many fishermen realize that there are found in the Atlantic Ocean offshore between Miami and Key West nearly 600 varieties of fish—an amazing total which constitutes one-fifth of the entire fauna of the American Continent north of Panama!

To even sketch the possibilities of sport fishing along the far-flung coral reef off Miami, the southernmost city of the Florida mainland and the fourth in size within the borders of the State, one must discount the old question: "Are all fishermen intentionally disingenuous, or do only liars fish?" for the facts concerning the variety, gameness, weight, and diversified color of the citizens of the deep, abounding in these waters, require a high rating as to the personal veracity and the courage to prove that ancient proverb about truth being stranger than fiction!

The fresh-water fisherman who, armed with light tackle, matches his wits against the quickness of the black bass, the brilliant generalship of the brook trout, or the fierce charge of the muskellunge, in his inland streams and lakes, may not consider it superior sport to "wet his line" in salt water along the *North* Atlantic coast, for not many of the fish in cold seas are considered foemen worthy of his steel.

DISCOVERING A NEW WORLD OF SPORT

Yet a different story can be told of their warm sea brethren, and he needs only to hunt out, for example, the fearless tarpon, the dashing sailfish, or the powerful and valiant bonefish, not to mention a score of other finished fighters of the Gulf Stream, to realize that he is called upon to extend his every faculty and skill to bring such game alongside as trophies of his prowess.

It would be interesting to have a motion-picture record of the thoughts which flash through the mind of even an experienced inland fisherman the first time he feels the tiger-like swoop of a five-foot barracuda, the yank of a hundred-pound amberjack, or the sullen surge of a big

Photograph by Charles W. Kotcher

GETTING THE FISH ASHORE AFTER IT HAD BEEN PARTIALLY DISMEMBERED

It took a long while and much effort to get the devil-fish ashore at Bimini so that the hide and cartilage structure could be preserved for mounting.

grouper on his line; for even when armed with the heaviest rod, a reel as big in comparison as the cylinder of an automobile engine, and a line which approaches a hawser in thickness, he is pretty sure to wish, at least subconsciously, that his equipment was twice as formidable and his arm thrice as strong.

What, indeed, must his sensation be the first time when, looking overboard at his baited hook 30 feet below in the clear waters of the Gulf Stream, he sees, as plainly as if in a mirror, the approach and attack of a giant jewfish, which is just as likely to weigh 500 pounds as 50, for it sometimes grows as big as a pony along the Florida coral reef and is just about as strong!

UNRELATED MONSTERS OF THE DEEP

When one starts in to tell of the amazing variety of undersea life along the Florida east coast, it is difficult to decide where to begin and end, for it is an inexhaustible subject. Such being the case, I will not attempt a survey of it now, but will confine myself to the experience of our party in hunting and capturing a devil-fish, said to be the largest specimen taken in American waters in twenty years.

In the general mind the devil-fish and the octopus are frequently confused, whereas they belong to entirely different fish families, and the only physical resemblance between these two gentry lies in the fact that they both live in the same waters. The devil-fish, or *Manta birostris* of science, belongs to the giant ray family—a huge batlike creature which uses its body fins as a bird does its wings in flying, with a waving, undulating motion, which propels it along beneath the water at remarkable speed.

Aside from its immense wing-spread, the outstanding feature of the devil-fish, and the one from which it derives its satanic name, are the lobes, or, as they are sometimes termed, cephalic fins, which extend outward and upward from each side of its flat head like curling horns.

In the adult fish the head fins are from three to four feet in length and about six inches wide. Nature has fashioned them of a leathery muscle tissue which spells strength in every ounce.

When the giant ray dashes into a school of fish, these head fins are of great assistance in obtaining food, for, like the arms of a boxer, they are in constant motion, whirling about and sweeping its living prey into the yard-wide mouth with almost lightning speed, as it hurls its great body about in its natural element.

The remarkable strength and twisting movements of the so-called horns are responsible for many of the allegations lodged against this fish as a menace to mankind, whereas, unless attacked and in panic, the huge sea-bat hurts no one.

As a matter of fact, however, there are a number of authentic reports of the devil-fish's running foul of a ship's anchor chain. True to instinct, it clasps the chain tight by wrapping its tenacula horns or feelers about it, applies its tremendous strength, lifts the heavy anchor as if it were a feather, and starts to sea with the anchor, chain, and ship, to the amazement and terror of the crew, who cannot believe their very eyes, as their vessel moves onward at a fast pace without a sail set or an engine's turning over, when, to all appearances, a moment before their vessel was moored to the ocean floor.

THE OLD MAN OF THE SEA

The octopus, on the other hand, although sometimes termed "devil-fish," is of another family entirely, an invertebrate, known to science as the typical genus of Cephalopods, or, in plain words, the highest class of mollusca, in which squids, cuttle-fish, and octopi are grouped. In Pacific waters the giant octopus, technically known as *Octopus punctatus,* grows to an immense size; indeed, captured specimens have measured a radial spread of 20 to 30 feet.

In appearance the octopus is most repulsive, having a large, ugly head, a fierce-looking mouth, armed with a pair of powerful horny jaws, shaped much like a parrot's beak, atopped with two diabolical eyes set close together, which are positively capable of sending forth a demoniac glare when angered. The grotesque head is mounted on a somewhat oval body, from which radiate eight arms, usually united at the body base by a membrane. The arms or tentacles are

provided with rows of suckers, with which it clasps and clings to its prey with uncanny strength and quickness.

As a rule, it will not give battle to man unless angered or injured, but when challenged will fight to the last, doing its best to pull the object of its wrath beneath the surface of the waters.

THE START FOR THE HUNTING GROUNDS

From the Florida reef the run across the Gulf Stream to the nearest islands of the Bahamas is a matter of 65 miles. We started from Miami at noon, guests of James A. Allison, on board his sea-going motor yacht *L'Apache,* with a 25-foot motor-driven fishing boat bobbing along behind in tow.

In the party of fishermen were Mr. Allison, Captain Charles H. Thompson, of Miami, the internationally known authority on the fish of the east coast of Florida; Commodore Charles W. Kotcher, A. G. Batchelder, and the writer, together with the captain and crew of the *L'Apache.*

Assisted by the northeastward pressure of the ever-moving Gulf Stream, we made splendid progress, and that evening cast anchor behind Bimini, a tiny isle which rests like a jeweled feather on a summer sea, the westernmost outrider of the Lower Bahama group. Bimini is a quaint little coral dot a few miles long and a quarter of a mile wide, quite covered with clusters of coconut palms and tropical plants, its tallest headland rising but a few feet above the surface of the old Atlantic—an out-of-the-world spot peopled by a few score of Bahama negroes, who eke out a precarious existence by fishing, gathering shells, and, in a small way, cultivating sisal, the fibrous plant from which hemp rope is made.

Approaching the island, the ocean bottom for miles offshore is carpeted with snow-white sand, and so clear is the water that there is no difficulty in studying the vast marine gardens 30 to 50 feet below the surface.

Due to the white sand beneath the sea and the glorious blue of the sky, with the ever-changing cloud effects overhead, the bewildering gradations of color to be seen in these waters challenge description and fill the heart of the artist with despair, although he paint with the inspired brush of genius.

OVERSEAS CEREMONY

The Bahamas being colonies of Great Britain, of course her authority extends even to this little-known spot. Therefore, Bimini boasts a port officer—an English gentleman, who also serves as the Crown Commissioner, Police Magistrate, Customs Collector, and Consular Official for examination of passports, as well as being physician and school teacher to the island's inhabitants. In short, he is the Twentieth Century Pooh Bah, who, with much courtesy and dignity, meets the infrequent foreign craft when it drops anchor upon arrival, inspects all qualifying documents, then sadly waves adieu from the beach when the visitor sails away.

THE SEA SUPPLIES THE LARDER

Up to the day of our arrival, there hadn't been a piece of fresh beef or a bit of butter on the table of the Crown's Representative for nine months, much less that of a single one of Bimini's humbler inhabitants, for the isle is more than a hundred miles from Nassau, and even the mail-boat was conspicuous by its absence during the period of the European war, when enemy submarines were in South Atlantic waters.

So it is that the sea furnishes food for the Biminites, supplemented by a few vegetables, flour, and salt meats, when they can get supplies from Nassau. Conch, the marine animal which inhabits the beautiful spiral shell, so fashionable as a parlor ornament a generation ago, is the chief article of food, and the natives consume thousands of them each year; indeed, it can be considered their main article of food.

After we had received and returned the official call of the Crown's Representative, we had visitations alongside from several shore boats, manned by dusky-hued merchants, each tradesman clad, on an average, in one and a half garments, who, with a happy grin and a hungry look, offered for sale varieties of sponges, brilliantly colored conch shells, sea-beans, and tortoise shell, the last-named article being obtained from the

Photograph by A. G. Batchelder

SUNSET IN THE TINY HARBOR OF BIMINI

This little isle on the western rim of the lower Bahama group is destined to become very popular as a cruising haven for yachts sailing from Miami and other Florida ports. The inhabitants, 99 per cent Bahama negroes, earn a haphazard living by fishing and in a small way cultivating sisal, from which rope is made. They live almost entirely upon fish and conch, the latter because of its valuable properties being especially used for food.

Photograph by James A. Allison

THE BEACH AT BIMINI, BAHAMA ISLAND

The island of Bimini offers a safe and comfortable harbor for visiting yachts of not too great draft. The inhabitants are as quaint and interesting as the isle upon which they are born, live, and die. The *L'Apache* can be seen at anchor offshore.

hawk-bill turtle, which is quite plentiful in these waters.

THE LURE OF THE TROPICAL NIGHT

It was like pulling teeth to go below deck and leave the wondrous beauty of the tropical night, with the soft, cool touch of the ever-blowing trade wind, the shadowy grace of the giant coconut palms swaying and whispering on the near-by beach in the moonlight, while the surf, grounding upon the coral strand on the outer side of the isle, lulled us with its crooning obligato.

But the wiser heads spoke of the need of a good night's rest to prepare for the battle royal which we hoped was in the offing, and so we regretfully went below and to dreamland instead of having a try at the tarpon which we could hear jumping and rolling on the surface, like playful puppies, only a few hundred yards astern.

At sunrise the next morning all hands were up and ready for the fray. The chef soon had a hot breakfast served, after which we piled aboard our motor-driven fishing boat, upon which our rods, lines, and harpoons had been made ready the night before.

Making a course out through the island channel to the open sea, all of us excepting the steersman hung over the side to enjoy the amazing sights below in the deep ocean pools. One of us would excitedly point to a squad of six or eight big tarpon lazily wallowing about far below—lords of their element, unafraid; therefore ready to give battle to anything except, perhaps, a tiger shark.

Another startled angler would call from the other side that a 10-foot hammerhead or a nurse shark was rolling an eye at him from the ocean floor, while still another inland fisherman wanted to jump down among a school, numbering possibly ten thousand large and small mangrove snappers, busily parading up and down a long stretch of coral shelf on the bottom, which afforded them instant hiding places in case of the sudden appearance of hungry enemies.

Passing out over the entrance bar, we set a course for the open sea, and soon all were scanning the pulsing bosom of the Gulf Stream for big game, like the crew of a submarine destroyer peeling their eyes for a periscope in the danger zone.

Strange as it may seem, the fish of the warm seas do not appear to have the slightest apprehension of danger from the noise of a motor-boat, and if attracted by the bait or not disturbed by the approach of a natural enemy below water, one can not only get very close to them, but has little difficulty in keeping the big fish in sight, once they are located and something of their habits known.

After a while Captain Thompson called our attention in his quiet way to a long, dark shadow not far below the surface a couple of boat-lengths away, and the boat was turned toward the first sign of our quarry, which he said was a "herring-hog," a species of porpoise. It proved to be an adult about eight feet long, weighing around four hundred pounds, and as this species destroys great quantities of foodfish, we went for it.

Reaching the proper position to strike, a hand harpoon was thrown, found its mark, and away the herring-hog went at a fast clip, the line fairly smoking from the barrel. And soon we were being towed along—a novel sensation to the novice. One of the less experienced fishermen of the party was given the harpoon line with instructions to bring the big fellow alongside forthwith, and further instructed above all to "keep his head up," the rest of us sitting back to enjoy his attempts to obey orders.

About twenty minutes after the strike and while yet the herring-hog was showing slight signs of tiring, although this could not be said of the perspiring fisherman into whose care he had been given, a considerable disturbance was observed on the surface of the water about a quarter of a mile away, and it was judged to be either a leopard shark at kill or a battle royal between two big denizens of the deep. Anything can be expected in these waters.

THE REAL BUSINESS OF THE DAY

It was our business, however, to have ring-side seats at this battle, whatever it was. So all hands took hold of the herring-hog line and, reversing the engine, which was not very sportsmanlike, but decidedly effective in checking it, we

brought him alongside without further loss of time; then turned our attention to the new mystery now close at hand.

We were all excited at the thought of getting a harpoon into a big leopard shark, which will fight any and everything that swims, and, according to all deep-sea fishermen, is really the only member of the shark family of whom man need be afraid while in the water.

But the reader can imagine how our interest was increased when all at once Captain Thompson, who, having uncanny eyesight plus long experience with sub-sea life, suddenly exclaimed: "Stand by, men; it's the biggest devil-fish I have ever seen!"

As we drew near it seemed to me that the entire bottom of the ocean in that area was suddenly dark and slowly moving off, and I discerned in the translucent depths a gigantic shadow which had the appearance of a huge bird flapping its wings and swinging its long, thin tail from side to side, as it flew slowly along.

While we were coming up within striking radius of the fish, which was evidently devouring something it had killed and was paying no attention to anything else, our harpoon lines, used in dispatching the herring-hog, had been straightened out and put in readiness for the combat which was to come.

As soon as we came near enough, Captain Thompson let fly with his heaviest harpoon, and then, as the little boy said when he dropped the cat into the pail of stewed tomatoes, "the fun began."

I am sure that none of us was ready for what followed. The devil-fish rose as though hurled upward by a submarine explosion beneath it. One of its great bat-like fins broke above the surface, sending gallons of water over us and splintering the harpoon pole against the boat's side as if it had been a match stem; then its 10-foot pectoral wing struck the water with a terrific impact, making a noise which could have been heard several miles away.

For a moment the monster seemed bewildered, and that lost moment cost him dear, for it enabled us to throw another harpoon, which struck deep into its body near the spine. Away it started to sea, taking our harpoon line with it, at a pace which made us apprehensive regarding its length, although we had, as we thought, a wide margin for safety. Gradually all hands put their weight against the line, and as the boat was by this time moving properly on an even keel, we took a wrap around a bow cleat and started seaward—giant fish, boat, and crew!

Every once in a while the devil-fish would literally hurl itself several feet out of the water, and its huge body would come down with a crash like the explosion of a 42-centimeter shell! Moreover, each time it broke on the surface it looked larger than before. Now and then it would sound for deep water in an effort to shake us off, and several times it went down so far that we stood by with hatchets to cut the lines at the last moment, in the event the bow should be drawn completely under water, as came perilously near happening more than once.

All of a sudden the lines slackened, and we frantically hauled in as the monster turned and dashed toward the boat, coming up almost, but not quite, under our craft, its gigantic bulk lifting one side of the heavy launch well out of water and giving us a pretty stiff scare.

THE BEGINNING OF THE END

With his usual skill and presence of mind, however, Captain Thompson let drive another harpoon he had at hand, which found lodgment in the devil-fish's head, and away it dashed again. With two harpoon lines, one in each side of the body, we were actually able to drive the monster as one would a runaway horse, swerving it toward the distant shore of Bimini and into more shallow water by the process of pulling first on one line and then on the other, which course was a little too much for the fish to resist. Meanwhile time was flying.

By this time the devil-fish had towed us for about ten miles, and although it was losing much blood, it was still going strong; so our next experiment was to throw out and let drag our anchor in order that this maneuver might further impede its progress. But this expedient made little difference to this giant, for it continued to pull us along as if our heavy craft were only a birch canoe.

Photograph by James A. Allison

TWENTY-TWO FEET ACROSS FROM TIP TO TIP

A most remarkable photograph of the giant devil-fish, with the tips of its wing-like fins above water, actually towing a 25-foot motor-boat at an estimated speed of 10 miles an hour. There were three harpoons in the broad back of the fish at this stage. The sea monster had towed the heavy launch many miles, but was still going strong when this picture was made.

Photograph by James A. Allison

THE GIANT DEVIL-FISH IN ITS NATURAL ELEMENT

Undoubtedly the first photograph ever made of a live devil-fish under water. Note the two horn-like fins curving near the head, from which the devil-fish takes its name. The giant was about six feet beneath the surface and growing weak from great loss of blood and its long fight extending over hours.

Photograph by Carl G. Fisher

THE GIANT FISH AND ITS CAPTORS

Note the curling, horn-like head fins of the devil-fish, with which by a circular motion it sweeps live food into its mouth by the bushel when it dashes into a school of fish. The series of vents on its belly, which look like the hood of a well-known automobile, are in reality the breathing apparatus, or gills. The dark object hanging from the wharf on the left is a herring-hog, a species of porpoise, about eight feet in length and weighing about four hundred pounds

Photograph by J. O. La Gorce

THE DEVIL-FISH PULLED OUT OF ITS HABITAT FOR INSPECTION

It required the continued effort of fifteen stalwart Bahama sponge fishermen, many thicknesses of the heaviest manila rope, and a large block and fall to pull the sea monster partially out of the water and alongside the wharf to be photographed. The ropes broke a dozen times, and even the wharf structure sagged and cracked with the dead weight of the huge fish. This view is the underside of the devil-fish.

After an hour or so, however, during which it alternated between trying to pull the bow under water and suddenly turning and endeavoring to come up under us, the anchor began to catch hold better, and our giant was becoming a little more amenable to reason, so that a number of times we were able to haul in slack, rearrange our lines, and even to get up within 20 or 30 feet, as it labored along with its great batlike fins, a little less powerful in stroke and somewhat slower, in plain sight, five or six feet below the surface of the water.

It was at this point that Mr. Allison secured the pictures, which we have every reason to believe are the first and only actual photographs of a giant devil-fish alive in its natural element. These photographs, because of the refraction of light in the water, do not give a clear idea of this monster's enormity, and make it hard to realize that our remarkable catch measured 22 feet across from the tip of one pectoral fin to the other and 17 feet 1 inch from the head to the end of the tail, and, moreover, weighed considerably more than 3,000 pounds.

Seeing that it was well-nigh impossible to give it a death blow, and that at any minute in its jockeying the fish might come up squarely under the boat and upset us in spite of all that we could do, and as all manner of sharks had been attracted by its struggle and loss of blood, we naturally did not relish the thought of any such experience, so we signaled to the *L'Apache* for a gun.

Luckily, about this time, a fast-sailing little island sponge boat approached us to see what the excitement was all about, and we managed to make the spongers understand that they must go back to the yacht and bring the rifles, which had, unfortunately, been forgotten in our hurry to get started in the early morning.

VICTORY AFTER HOURS OF BATTLE

The native mariners were most willing to help, and made all haste possible; so, after another half hour of skirmishing and ring generalship on both sides, the ship's motor-driven dory came tearing out with an express rifle, and we were enabled to give our giant its *coup de grâce*.

Until that moment not one of us realized that nearly five hours had elapsed since we first tackled this Jumbo of the deep, and none of us knew how tired we were, for in good truth we had been far too busy to give a thought to such small matters. Although this fish finally had four harpoons in its body and a dozen shots in its head and heart, it was by no means dead, and even then we had considerable difficulty in towing it into the harbor, some miles away.

Naturally, the natives of Bimini were very much interested in the capture, for devil-fish destroy great numbers of food-fish, and we experienced no difficulty in engaging the services of 15 of them to help to get the carcass ashore, having decided to try to remove the hide and bony structure for mounting.

By bringing into play a heavy block and tackle borrowed from the islanders, which was used for lifting and weighing cargoes of sisal fiber, and after much breaking of ropes, to say nothing of the wharf structure's being in serious danger of collapse because of the great weight of the fish, we finally succeeded in getting most of its body out of water, so that it could be photographed and weighed by means of a large sisal scale. The utmost capacity of this scale was 3,000 pounds, and this is all which is claimed for the fish, although we judged it weighed 4,000, or possibly 5,000, pounds.

Through the courtesy of some friends, who had run over from the Florida coast in a fast express cruiser to join us in the sport, but who arrived too late to take part in the actual capture, we were enabled to send back the necessary parts to an expert taxidermist for mounting, although it was a serious question to know what to do with so enormous a thing after it was mounted, for not many rooms will take care of a fish measuring 22 feet across, and it was decided it would be presented to the Cocolobo Club, the unique cruising and fishing club located near Miami, where a special room is being built to receive it.

SIGHT-SEEING IN SCHOOL

Taking Twenty Million Children on a Picture Tour of the World

By Jessie L. Burrall

Chief of School Service of the National Geographic Society

NO FACTOR of American life affects us as a people more vitally than does the public school. It takes care of our boys and girls during more than half of their waking hours for nine or ten months every year. It molds their habits of body and mind for life.

How many are there of these boys and girls in our schools today? More than twenty million—enough to fill four magnificent cities the size of our great New York, or eight the size of our energetic Chicago.

The armies of war disband, but these children continue to come on and on, wave after wave, year after year, a mighty army mobilized for service and for life. Let us visualize them as marching some fine morning four abreast across the continent from the Golden Gate, and see how long the line will be.

Here they advance, across the Sierra Nevada and the Great Basin, between the snow-covered peaks of the Rockies, down across the Great Plains—marching steadily on—crossing the Mississippi, passing

Photograph by M. O. Williams

"THIS IS THE WAY WE GO TO SCHOOL" IN CHINA

Every hour of the 24 sounds the call of the schools to hosts of girls and boys somewhere on the globe.

Photograph by Lieut. Col. Alfred Heinicke

A WRITING LESSON IN PERSIA

This budding savant, with his reed pen, Chinese ink, and knee-cap desk, gravely insists that, although Persian is undoubtedly the finest language on earth, it surely must be the hardest to write.

the headwaters of the Ohio, through the storied Appalachians, to the Nation's Capital—an unbroken line, four abreast, across the United States, with several thousand left over in San Francisco for good measure. There they are—the school children of the United States—with golden hair and brown hair, black eyes and blue, with rosy lips and springing step, all marching together in the army of the public schools.

CHILDREN THE CUSTODIANS OF THE FUTURE

And each unit in this stupendous number represents an eager, throbbing, little soul, looking out in joyous anticipation or in timid wonder toward the life ahead. Whatever is in the schools sends its vital currents through all these minds and hearts out into the life of our land.

When we think that within a few short years the fate of our country will be in the hands of these children, that inevitably they will be the next America, we realize the importance of the training that they should have.

The schools have suffered many an upheaval, but none at all comparable with the great crisis brought on by new conditions arising from the war. Educators all over the land are meeting these needs in amazing measure.

For several years vast changes have been going on, which, accelerated by the war, are now so far-reaching in their results as to amount to a practical revolution in aim, tending to alter radically the materials used as well as the methods of teaching.

GEOGRAPHY TEACHING—OLD AND NEW

An excellent illustration of recent and rapid advance is seen in the work in geography. To appreciate all that this means, we must think back to our own geography lessons.

We remember the reading over and over of the lesson and the halting recitations of such facts as we could call to mind. We learned, "An island is a body of land completely surrounded by water" and "A mountain is a high elevation of land composed mainly of rock." We struggled through, "Ponds and lakes are bodies of water that occupy depressions in the land." Whatever depressions in the land might be, it was beyond us to fathom; but woe engulfed us if we could not tell that lakes occupied them.

We sometimes had ten or more of these definitions in one day, and some of us were "kept in" on sunny afternoons because we just could not make them stick in our minds. We could not visit the real islands, peninsulas, straits, and gulfs, and pictures of them were few and expensive.

So the hard definition road was the only way to the dim and often inadequate mental pictures we formed of these things. As we read over and over the pages of our books, few of us ever dreamed of the fascination of Mother Earth and the lure of her mysteries.

But now our children have pictures of the snowy peaks, with timber-line and flowery meadow below. For them, as well as for the few who can travel, the Rocky Mountains lift their lofty ranges, the Yellowstone offers its wonders, and Niagara Falls pours out its rainbow spray. Pictures can now bring to our children all of the beauties and wonders of the earth.

THE MAP COMES TO LIFE

Even a map can glow with fire and meaning! The interests of our sturdy, active boys and girls center in the world about them. They are full of curiosity about all the varied wares of the corner grocery. The bunches of bananas turning slowly from green to yellow set them to wondering whence they came.

That seems a far cry from the map of Central America and a study of "the surface, climate, population, products, and capital cities" demanded by courses of study; yet now the pictures make the magic connection. With them the children go on a journey to Costa Rica. Paying neither carfare nor hotel bills, they, nevertheless, visit the banana plantations, learn of banana culture, and become acquainted with the black boys and men who gather the luscious fruit for them.

Costa Rica becomes a most interesting place. Now they like to study the map, for that country is no longer a small pink spot, but a place where real people live and work and play.

© Donald McLeish

AN OPEN-AIR MOHAMMEDAN SCHOOL AT BISKRA, NORTH AFRICA

The mere reading of verses from the Koran is in itself considered a meritorious act, while to teach the boys to recite the book by heart is the great object of these schools. In rhythmic sing-song, to the accompaniment of swaying bodies, the class progresses through the long and difficult task.

Photograph by Harriet Chalmers Adams

THE VILLAGE PUMP IN THE PHILIPPINES

This Ifugao mother has brought her baby to the bamboo water tube for a drink, and perhaps a bath. Water is piped from the heights in this manner and is not impure unless it has drained rice terraces higher up.

Other regions become equally vivid. Washington is not a black dot in a tiny yellow square, where an unknown quantity called the Government makes laws; but it is its own true self—a city of beautiful parks and wide streets, of stately buildings and historic monuments, a capital city of which any girl or boy can be proud.

So the pictures bring the maps to life, and we find the children locating countries, rivers, and lakes, with a personal interest in each. Let us trace throughout the schools this fundamental change in geography teaching that has come about through pictures. Let us see how they give new life to the work from primary through grammar grades.

GEOGRAPHY FOR THE PRIMARY CLASS

No child needs to learn to read before he can know of the world beyond his horizon. He can have his geography lessons from the beginning. He no longer uses the laborious path of the printed page or even depends upon the clever oral pictures that the teacher is supposed to be able to give about "Little Indian, Sioux or Crow," or "Little frosty Eskimo." He now has innumerable pictures of far-away folks. He sees the Eskimo father at his hunting, the mother in her fur clothing, and the children with their toys.

At Thanksgiving time, when the stories of Pilgrim life and adventure arouse interest in the Indian, he learns how the red children live. In the spring the pictures tell him about his little black and brown brothers, who romp and play where the sun is high in the sky at noon and where no snow falls. By the same happy picture path he learns of the lives of children in England and Holland, in far-away China and Japan.

PICTORIAL PHYSICAL GEOGRAPHY

But, meanwhile, as he grows his interest broadens. Suddenly he wants to know where the brook comes from, what

Photograph by Harriet Chalmers Adams

MARKET SCENE AT ILOILO, PHILIPPINE ISLANDS

The market at Jaro, a suburb of Iloilo, is famous for its cloth of native weave. The finest jusi and pina in the Philippines is woven near Iloilo. At the window of every other house on the island a woman is seen at a crude loom.

makes the stones in its bed so smooth, and why the quartz pebbles are so white, while other rocks are gray or black. Then it is that pictures lead him to the story of the mighty forces of water. He need not begin by reading about detritus and erosion. He sees pictures of brooks and rivers, dashing down the hills near their sources, flowing broad and free across the plains, and lazily idling through their vast deltas.

He visits neighboring hills and sees how heavy rains dig out gullies in unprotected soil. Then he studies views of wooded and denuded slopes, and of floods caused by careless deforestation. From these he gains ideas of conservation and the wise use of our national resources. He has illustrations showing the skill and value of the forest ranger, and becomes careful in lighting his own camp-fires. Best of all, he gets the idea of his responsibility for the care of public property. "What belongs to all of us is for me to enjoy, but not to hurt," he thinks at the close of a lesson.

Again, the pictures tell him the story of the great glacier that once covered the whole northern part of the United States, and how it ground rock to powder, smoothed off the rough edges, made our lakes, and gave us our soil. From this the teacher leads him to volcanoes, geysers, and earthquakes. How fascinating they are in the pictures! He can take in at a glance what could not be gained in

Photograph by Harriet Chalmers Adams

HATS FOR SALE: CEBU, PHILIPPINE ISLANDS

These hats, of coarse weave, are worn by the taos in the rice field and are exported from Cebu. A fine grade of hat is exported from the Philippines, made from abaca, or manila hemp.

an hour's careful reading, and his knowledge is clear-cut and accurate.

INTERMEDIATE INTERESTS

The pictures likewise care for all the varied needs and interests of the liveliest group in our schools. Not even the darting humming-bird can vie with the activity of boys and girls between the ages of eight and fourteen. Nowhere else is to be found the abounding vitality and the insatiable curiosity that they possess. They run miles in the course of a day's play, and at night are ready to tease for just one more game of ball. They want to hammer up buttons to "see what they are made of," and to take the clocks apart. Their interest in how things are done is now used to broaden their knowledge of life and work.

Here again pictures are the magic carpet that takes the children through the coal and iron mines and shows them how gold and silver are separated from their ores.

No Alice in Wonderland is more exciting than a visit to the South African diamond mines.

No fairy in story ever performed the feats that are done every day in our large factories, where lumps of graphite and slabs of wood are turned into lead pencils; or at our power-houses, where the force of water rushing over the dams is turned, at a flash, to light and heat.

No tale of the key-flower that opened the door of the rocks can vie in thrill with the opening of the mountain at Culebra Cut and the linking of the oceans at Panama.

No witch at her cauldron could arouse half the wonder and awe that comes from the sight of one of our huge blast furnaces, pouring forth its fiery flood of molten metal.

AWAITING THE ARRIVAL OF THE SHAH: PERSIA

With a history reaching back eight hundred years before Christ and a halo of fascinating tradition and legend three thousand years old, the Persia of today offers her share of interest to the student of the world. Many a touch of nature runs the earth around. Costume, complexion, and attainments may vary, but the same interests call and sway a crowd in either hemisphere. The arrival of a notable is a universal magnet.

All these wonders can now become a part of every child's life through pictures.

FOR THE OLDER BOYS AND GIRLS

But it is among the older boys and girls that the picture comes into its own. When the boisterous, noisy boy begins to be thoughtful, and the romping girl to appreciate and love the beautiful for its own sake, then the picture acquires a newer and deeper meaning. To the teaching of such practical things as the uses of water-power and the laws of vapor formation must be added the poetry of cloudland. Shelley's poem is a delight when illustrated by pictures:

"I sift the snow on the mountains below,
And their great pines groan aghast;
And all the night 'tis my pillow white,
While I sleep in the arms of the blast."

How much more of meaning is added to the words when the children see the "rent in the wind-built tent," and the "calm river, lakes, and seas."

As Browning so aptly puts it,

"We're made so that we love
First when we see them painted, things we have passed
Perhaps a hundred times nor cared to see."

So the picture,—giving, as it does, one definite, interesting idea, and shutting out all the distracting details, which always wait just outside a real landscape—shows to the student exactly the best. To the many children who have not been taught to see, as well as to the myriads who can never travel to the snow-clad peaks, the pictures bring world treasures.

THE BEST GIFT OF THE PICTURES

Realizing all that the introduction of pictures has meant in taking the horror from the definition, in bringing the map to life, in showing, as in a magic mirror, all the industries of our earth, we finally come to the best gift that pictures bring to the school—the friendly feeling toward all mankind which the children can get in no other way.

Our boys and girls can now know that children in every land, though wearing different kinds of clothing and eating strange food, like themselves work and play—often at the same games—listen eagerly to almost the same stories, and, best of all, enjoy a joke just as they do. Our boys and girls need no longer feel:

"Little Turk or Japanee,
O! don't you wish that you were me?

"You have curious things to eat,
I am fed on proper meat;
You must dwell beyond the foam,
But I am safe and live at home."

The pictures make them want to taste the "curious things to eat," anxious to climb the coconut trees of the tropics, and to explore the far-distant Antarctic. Though the pictures of our own America make their hearts beat high with pride of country, they do not feel that they, as American boys, are different from French or Russian or Australian. They feel that they are a part of a great world family.

PROMOTING WORLD PEACE THROUGH GEOGRAPHY

Such a feeling of friendliness is absolutely necessary among our children if we are to lay a broad foundation for future world unity. Permanent world peace can only be promoted through a sympathetic understanding of world peoples.

If we are to stand shoulder to shoulder with a new Russia; if we are to succor a war-torn Europe in its recovery; if we are to help an awakened Asia to full realization of the joy of citizenship; if we are to cement our friendship with South America—to take, in short, our place as the great teacher of democracy to all the world—our boys and girls must acquire a wide acquaintance with world peoples, which is the only possible foundation for true appreciation and friendliness.

And to the National Geographic Society has been given the opportunity of leading our schools into the sane, happy, efficient picture way of teaching. Literally hundreds of thousands of school children look eagerly for the NATIONAL GEOGRAPHIC MAGAZINE each month. Through its wealth of illustrations it brings the whole world within the horizon of every child in all the vast school army.

A recent striking illustration of how thoroughly NATIONAL GEOGRAPHIC pictures, the universal language, have become a part of many varied educational

Photograph by G. Heurlin

A POLITICAL SPEECH IN SWEDEN

Our students can now become acquainted with young folks in every land, finding them fundamentally alike—playing similar games, listening to almost the same stories, and, best of all, enjoying a joke just as well as we do. The sympathetic understanding of world peoples, which is the only possible foundation for permanent world peace, is fostered through a wide knowledge of pictures.

Photograph from Leonard A. Williams

THE JOY OF THE SEPARATE PICTURE (SEE PAGE 503)

Louise and Mabel, Tom, Dick, and Harry forget the lure of marbles, tag, or teasing while studying these. At the words, "Pictures down," straight backs and shining eyes will attest intense desire in each eager brain to tell the wonders of a particular illustration. How different the expression when all the pupils are reading the same paragraph and every one knows what is going to be said!

interests is seen in their wide-spread use in teaching English to our foreign-born soldiers during the war. The magazines were cut up and the pictures mounted on charts with appropriate sentences for conversation.*

Again, schools and libraries everywhere have been mounting the pictures on separate sheets for teaching, not only geography, but history and literature as well. However, the teachers do not want to cut up their magazines; they have no time to mount the pictures, and they want text written especially for their needs and classes.

A CALL WHICH MEANS WIDENING SERVICE

And so it has come about that, because of the great work the National Geographic Society has performed in bringing pictures into the school-room and in revivifying the teaching of geography, an insistent call has been sounded for a greater responsibility and an ever-widening service.

For some time there has been a country-wide demand for NATIONAL GEOGRAPHIC pictures on separate sheets for easier handling in the school-room, and the Society, ever glad to coöperate to the fullest extent in making geography fascinating and intelligible to every one, has spared neither time nor effort to arrange these pictures in the best possible form for the schools.

The wealth of its pictures simplifies the problem of selection and adaptation. There is literally a picture for every phase of geography teaching, for every topic, even for every word.

In accordance with the invariable custom of the Society to avoid in the Magazine highly technical phraseology, but always to give the richest of geographic material with scientific accuracy, and yet in such form as to be enjoyed by every one, so these pictures are arranged for the children and the schools.

* See "Bringing the World to Our Foreign-Language Soldiers," by Christina Krysto, in the NATIONAL GEOGRAPHIC MAGAZINE (August, 1918).

Photograph from St. Cloud Normal School

AN EIGHTH GRADE READING ON SPECIAL TOPICS

Photograph from Dorothy Vollmer

GEOGRAPHIC ENTHUSIASTS

Photograph by Harriet Chalmers Adams

A FLOWER SELLER OF YOKOHAMA, JAPAN

The Japanese are a merry people, those who work hardest being the most cheerful. Their flower carts are in striking contrast to the ugly, squeaking wheelbarrows of the Chinese peddlers. The Japanese love flowers above all things, their floral calendar for the twelve months of the year (the first being February) reading: pine, plum, peach, cherry, wisteria, iris, morning glory, lotus, "seven grasses," chrysanthemum, maple, and camellia.

Realizing that nothing can be absorbed into the child's life unless it has an interest for him, these pictures are chosen and arranged primarily for his needs and growth. Based on an intimate acquaintance with innumerable educators and thorough familiarity with courses of study and methods of teaching in every State, they are fitted in every way to actual school-room conditions.

HOW THE PICTURES ARE ARRANGED

Arranged in sets of 24 and 48 pictures on special topics, they illustrate definite parts of the curriculum, with about two hundred words of interesting text accompanying each picture.

They are printed on sheets nine by eleven inches, with the text beneath in large, clear type which can be read easily by children. The paper chosen has the same fine finish as that used in the Magazine, but is from four to five times as heavy, so that the pictures may be easily and safely handled, and also stiff enough to stand up around the chalk rail if so desired. To cap the sheaf, each set contains two or four pictures in full color.

The pictures themselves are chosen largely from the thousands published within the last few years in the Magazine, so that much of the expense has already been met. Moreover, the methods and aims of the National Geographic Society make it especially fitted and prepared for this great service to the schools.

ALL THE SOCIETY'S RESOURCES AT THE DISPOSAL OF TEACHERS

Because the Society is not a commercial firm, but exists solely as a medium for the increase and diffusion of geographic knowledge, no profit is made for any corporation or individual. Therefore, the entire resources of the Society, backed by its 700,000 members, can be at

Photograph from Dr. J. Howard Gore

ROYAL STATE BARGE: SIAM

Interesting indeed is the grace and ease with which this queer structure of far-away peoples skims lightly along the surface of the water. This is the King's own royal barge, made of solid gold lacquer in filigree style. It is manned by 60 paddlers. After each stroke the paddles, which are covered with gold leaf, are thrown up in the air. The brilliant sun playing on them with the silver of the dripping water produces a most beautiful effect.

Photograph by Harriet Chalmers Adams

BENGUET BRIDES OF LUZON, PHILIPPINE ISLANDS

The little women in the picture are aged thirteen and fourteen. One of the bridegrooms is seen in the background. Benguet women wear blouses as well as skirts, and cloth wrapped about the head, forming a sort of turban. They are very fond of ornaments, and smoke small brass pipes.

the disposal of the teachers and schools, making it possible for these geographic pictures to be published at an exceedingly low figure.

The Society whole-heartedly devoted its energies and talents to winning the war, and with far-seeing patriotism also plans ahead for the new America, striving to create still better standards of teaching and to fill the demands which these advanced standards require.

Pictures in the schools will solve one phase of the gigantic problem of the reorganization of our education, because they can give the pupil an adequate knowledge of our great country. That knowledge is the sound basis of all patriotism.

The National Geographic Society, through its PICTORIAL GEOGRAPHY* series, is especially glad to present, as the largest scientific organization in the world, its wealth of geographic knowledge to the vast army of American school children in such a way as to help to make each child a worthy citizen of our country and a benefactor of his fellow-man.

*For details of the PICTORIAL GEOGRAPHY series, see announcement elsewhere in this issue of THE GEOGRAPHIC.

Photograph by International Film Service

A NEW JERSEY COUPLE AND THEIR SEVENTEEN STALWART CHILDREN

While one can never tell how long he is going to live "until he is dead," Mr. and Mrs. Charles B. Casale, of Newark, are probably destined to survive to a ripe old age. An examination by Dr. Alexander Graham Bell of the genealogy of the Hyde Family reveals the fact that the parents who lived the longest had the most children, on the average. There are nine daughters and eight sons in this household. Mr. and Mrs. Casale are shown standing in the back row. Next row, left to right, are: Rose, Elizabeth, Jennie, Margaret, Helen, and Michael. In the front row, left to right: Frank, Joseph, William, John, Evelyn, Charles, Josephine with Ryta (the baby), Dominick, Eugene, and Catherine.

WHO SHALL INHERIT LONG LIFE?

On the Existence of a Natural Process at Work Among Human Beings Tending to Improve the Vigor and Vitality of Succeeding Generations

By Dr. Alexander Graham Bell

Author, in the National Geographic Magazine, of "Prizes for the Inventor," "Discovery and Invention," "Our Heterogeneous System of Weights and Measures," "Aerial Locomotion," and "A Few Thoughts Concerning Eugenics"

MOST people die before reaching middle life, and comparatively few live to be old.

This has always been so from the very earliest times; and, in spite of modern sanitation and the advance of medical science, remains true today. Only a small proportion of each generation survives the traditional Biblical age of threescore years and ten.

Under these circumstances is it not remarkable that so many people should have parents who lived to be old? Seventy is by no means an unusual age for a parent. Examine the history of the people you know and you will find that very few of them had parents who died before seventy, while a considerable proportion had parents who lived to be eighty or even much older.

An examination of several hundred cases, noted in the Genealogy of the Hyde family[1], shows that 18.7 per cent of these persons lived to be seventy or older; but 81.7 per cent had fathers or mothers who lived beyond seventy. About 13 per cent lived to seventy-five; but 65 per cent, or nearly two-thirds of the whole, had fathers or mothers who lived beyond seventy-five.

The contrast is still more marked when we consider persons who lived to extreme old age. Only 8.7 per cent lived to be eighty or older; and yet 48.1 per cent, nearly one-half of the whole, had fathers or mothers who lived to be eighty or older.

These are the results of an investigation of 1,594 cases in which the ages at death of the persons and of their fathers and mothers were all known.[2]

Such results seem to point to the general conclusion that *a very large proportion of each generation has sprung from a very small proportion of the preceding generation, namely, from the people who lived to be old.*

Another inference is that the long-lived people left more descendants behind them in proportion to their numbers than the others, and therefore, on the average, had larger families.

Of course, many widowers may have married again when they were well advanced in years and have had families by each marriage, but this explanation does not apply to women.

MOTHERS' AGES AN INDEX TO THE SIZE OF THEIR FAMILIES

We cannot, for example, suppose that mothers who died at fifty would have had more children had they lived to be sixty or eighty or a hundred; and yet investigation shows that the mothers who lived to extreme old age actually had, on the average, larger families than those who died earlier in life.

From the Hyde statistics we find that mothers who died before forty had, on the average, only 3.4 children apiece; and this is intelligible because many of the mothers passed away long before the conclusion of the reproductive period, and

[1] Genealogy of the Hyde Family, by Reuben H. Walworth, LL. D., 1864; a work relating to the descendants of William Hyde, one of the early settlers of Norwich, Conn., who died in 1681.

[2] See "The Duration of Life and Conditions Associated with Longevity, A Study of the Hyde Genealogy," by Alexander Graham Bell; published by the Genealogical Record Office, 1501 35th Street, Washington, D. C. $1.00.

Photograph by Gilbert Grosvenor

NINE SONS HAVE BEEN CONTRIBUTED TO THE WORLD'S POPULATION BY MR. AND MRS. MORRISON, OF ST. ANN'S, CAPE BRETON, NOVA SCOTIA

"The persons whose parents both died before sixty lived, on the average, 32.8 years (the Hyde Genealogy). Those whose parents both lived beyond eighty averaged 52.7 years; and where the parents died at the intermediate age periods the duration of life was intermediate."

AN EVEN DOZEN SITS AROUND THE FAMILY BOARD AT EACH MEAL IN THE HOME OF T. ALBERT FIELD

Longevity is an index of constitution. Long-lived persons have left more descendants in proportion to their numbers than the others, and therefore, on the average, had larger families.

Photograph by Corey, supplied by Louise Lacey, Secretary of the Genealogical Record Office

ELISHA CLARK PECKHAM, AGED 92, MIDDLETOWN, R. I., WITH MRS. PECKHAM AND THEIR ELEVEN CHILDREN. ONE CHILD DIED AT THE AGE OF TEN YEARS

The children of long-lived parents are, on the average, stronger, more vigorous, and longer-lived than the children of others, and there are more of them per family.

THE CENTENARIAN CLUB OF LOS ANGELES, CALIFORNIA, WHOSE MOTTO IS, "LIVE A HUNDRED YEARS AND GROW OLD GRACEFULLY"

Left to right, standing: Dr. J. M. Morrison, Vice-President, 97; Rev. H. Judd, 91; Rev. N. A. Millerd, 90; A. A. Annas, 96; Dr. H. L. Canfield, 90; C. R. Post, 92; J. H. F. Jarchow, 92; Senator C. C. Cole, 94. Left to right, sitting: Dr. A. M. Sherman, 92; Dr. J. M. Peebles, 96; S. Selleck, 94; Dr. E. C. Prugh, 95; Mrs. M. K. Bartlett, 92; Mrs. J. F. Howard, 92; Mrs. M. Offenbach, 90; Mrs. Stevens, 94; Rev. S. H. Taft, President, 92. Mrs. Taft in rear.

Photograph by L. H. Bellin

HE HAS SEEN MORE THAN A CENTURY OF WORLD CHANGES

John O'Reilly, born in Ireland, was 101 years of age when this photograph was taken. His father died at 45, but his mother lived to be 90. He was the youngest of eight children. His wife lived to be 84. The fact that more than a hundred years had passed over him had not prevented Mr. O'Reilly from planting his truck garden each spring or caused him to retire from the management of his grocery business.

Photograph supplied by Louise Lacey, Secretary of the Genealogical Record Office

MRS. LOUISA K. THIERS ON HER 104TH BIRTHDAY

The few who live to extreme old age are people who have proved themselves to be immune, or at least resistant, to the diseases that have carried off the vast majority of their fellows. Mrs. Thiers, who lives with her daughter, Mrs. Charles Quarles, in Kenosha, Wis., is in excellent health today. Her eyesight is good and she is alert mentally, following closely the news of the day. She was born October 2, 1814.

might have had more children had they lived longer.

Mothers who died between forty and sixty had 6.2 children apiece, and we would naturally expect that no further increase in the size of the family would be found in the case of mothers who died at later ages. But, as a matter of fact, the mothers who died between sixty and eighty averaged 6.6 children apiece, and the mothers who lived beyond eighty had average families of 7.2 children.[1]

When we remember that in all these cases the children were born before the mothers had passed middle life, it becomes obvious that the mothers who reached old age were *inherently* more fertile than the others. There is thus some correlation between longevity and fecundity. The parents who lived the longest had the most children, on the average.

But how about the children? Did they, too, live longer than the others? Yes, upon the average, they did.

Photograph by Charles Martin

THE OLDEST HUMAN BEING OF WHOSE BIRTH WE HAVE AUTHENTIC RECORD

Mrs. Ann Pouder, of Baltimore, Md., photographed on her 110th birthday, in the summer of 1917. She died a few months later.

The average duration of life of the 1,594 persons referred to above was 40.6 years. Their fathers, on the average, lived 70.9 years, and their mothers 66.0 years. Thus the fathers and mothers, on the average, lived longer than their children. This is always found to be the case when we deal with large numbers; and the reason is very obvious; for, of course, no fathers or mothers died in infancy or childhood, whereas many of the children died young.

LONGEVITY IS AN INHERITABLE CHARACTERISTIC

Investigation shows that a larger proportion of the children of long-lived parents lived to be old and a smaller proportion died young than in the case of the others.

The Hyde statistics afford conclusive

[1] See "The Duration of Life," etc., by Alexander Graham Bell. Table 17, relating to 671 fertile marriages of females resulting in the production of 4,022 children, or 6.0 children per marriage.

evidence that a tendency to longevity is an inheritable characteristic. For example, divide the 1,594 cases into three groups:

1. Those whose parents, neither of them, lived to be eighty.

2. Those having one parent who lived to be eighty or older, and

3. Those having parents both of whom lived to be eighty or older.

Now note the proportion of long-lived persons in each group. Only about 5 per cent of the persons in group one lived to be eighty; about 10 per cent of the persons in group two, and 20 per cent in group three (exact percentages 5.3, 9.8, and 20.6). Few of the persons who did not have long-lived parents behind them lived to be old. The long-lived proportion was practically doubled where one parent lived to be old and quadrupled where both parents lived to be old. The evidence indicates that heredity is deeply involved in the production of longevity.

If we divide the 1,594 cases into groups arranged according to the ages reached by the parents, and then calculate the average duration of life of all the persons in each group, not simply the proportion who lived to be old, we find that the persons constituting the longest-lived group were the offspring of the longest-lived parents, the members of the shortest-lived group came from the shortest-lived parents, with intermediates intermediate.

Number of Cases

Mother's age at death

Father's age at death	−60	60-80	80+
80+	131	206	184
60-80	251	328	172
−60	128	120	74

Average Duration of Life

Mother's age at death

Father's age at death	−60	60-80	80+
80+	42.3	45.5	52.7
60-80	35.8	38.0	45.0
−60	32.8	33.4	36.3

The persons whose parents both died before sixty lived, on the average, 32.8 years. Those whose parents both lived beyond eighty averaged 52.7 years; and where the parents died at the intermediate age periods the duration of life was intermediate.

The figures indicate very clearly that there is a correlation between the duration of life of the individual and the duration of life of his parents; and, conversely, we may conclude that the longest-lived parents, on the average, had the longest-lived children; the shortest-lived parents the shortest-lived children; with intermediates intermediate.

We have only to glance around us at the different forms of animal life to find plentiful indications that the duration of life is influenced, and indeed controlled, by heredity. Each species has its own limit of life, and man is no exception.

The contrasts are often very great: For example, a horse born the same day as a child dies of old age before the child has reached full maturity. Just think of the differences. The horse may become a parent when the child is only a toddling three-year-old, a grandparent by the time the child is six, and several generations of horses may appear before the child has even reached marriageable age.

The duration of life of each species is controlled and limited by heredity, and heredity even establishes different limits for groups of animals within the same species. The long-lived tend to produce long-lived offspring, the short-lived, short-lived offspring, etc.

A million people may be born on the same day, and we know that multitudes of them will die during the very first year of life. So great is the mortality during infancy and childhood that we may be perfectly certain that the majority of the

Photograph by W. T. Oxley, from the Collections of the Genealogical Record Office

FIVE GENERATIONS OF WOMEN IN A MINNESOTA HOUSEHOLD

Mrs. Karl Melden was 89; her daughter, Mrs. Anne Kastell, 61; granddaughter, Mrs. Hannah Gustafson, 41; great-granddaughter, Mrs. Ann Bergernt, 21; and great-great-granddaughter, Mary Valdine, aged 7 months, when this photograph was taken. Note the remarkable inheritance in similarity of the eyes, even in the baby.

people will have passed away long before the lapse of fifty years. The extreme limit of human life probably does not extend very far beyond the hundred-year mark, and only very few live to be even eighty or ninety.

The few who live to extreme old age are people who have proved themselves to be immune, or at least resistant, to the diseases that have carried off the vast majority of their fellows. They have been exposed to all the diseases and accidents of life and have not succumbed. They have proved themselves to be resistant, not to a single disease alone, but to all diseases; and the fact that they

NO. 1. THE REMARKABLE MC MURRAY FAMILY: FOUR SUCCESSIVE FIVE-GENERATION GROUPS

This photograph, taken 28 years ago, shows Mrs. Lavinia McMurray, aged 83; her daughter, Mrs. J. B. Gregory, aged 63; her granddaughter, Mrs. Martha Violett, aged 43; her great-granddaughter, Mrs. A. J. Wood, aged 23; and her great-great-granddaughter, Veda Wood, aged 3 (see also page 513).

NO. 2. ONE FAMILY OF MRS. MC MURRAY'S DIRECT DESCENDANTS 22 YEARS LATER

Mrs. J. B. Gregory of the first picture is now a great-great-grandmother at 85. Her daughter, Mrs. Martha Violett, is a great-grandmother at 65; Mrs. A. J. Wood at 45 is a grandmother; and Veda Wood (now Mrs. Wesley Sibole), the mother of Ruth Sibole, aged 8 months.

NO. 3. ANOTHER GROUP OF THE MC MURRAY FAMILY

Mrs. McMurray, aged 85; her eldest son, Robert, aged 62; her son's daughter, Mrs. Lavinia Merkle, aged 40; Mrs. Merkle's daughter, Mrs. Annie Stevens, aged 23; and little Gladys Stevens, Mrs. McMurray's great-great-granddaughter, aged 4.

NO. 4. THE MC MURRAYS OF THE MALE LINE 19 YEARS LATER

Robert McMurray has become a great-great-grandfather, aged 81; his daughter, Mrs. Merkle, is a great-grandmother; her daughter, Mrs. Stevens, a grandmother at 42; and Gladys Stevens, of No. 3, is now Mrs. Poe, the mother of two children.

Mrs. Lavinia McMurray was the first of nine children. Her three youngest sisters all lived to celebrate their golden weddings. Her husband died at the age of 81. They had 11 children; four died in infancy and four at the following ages: 24 (M. Gregory), 84, 76, and 72. Three are still living, their ages being 70, 72, and 89. At the time of Mrs. McMurray's death, there were living three children, 43 grandchildren, 55 great-grandchildren, and six great-great-grandchildren—107 living descendants at the time of her death.

transmit to their offspring a tendency to live long shows that the disease-resistant quality is handed down to their descendants.

Of course, longevity itself is not a thing that is capable of direct inheritance; but the fact that longevity seems to run in families shows that a *tendency* to long life can be inherited. It is not longevity itself that is transmitted, but something else that tends to produce long life. What is really inherited is probably a tough, wiry constitution, which enables the fortunate possessor to survive the multitudinous ills that flesh is heir to and live on to the extreme limit of human life. From this point of view, the attainment of old age is extremely significant.

The people who live to be old represent the *disease-resistant* strain of their generation; and, on account of their superior fecundity, this disease-resistant quality is distributed very largely through the population. The weak and delicate do not, as a rule, live very long; nor are they capable of bearing large families. It is the strong and vigorous who live to extreme old age and leave many descendants behind them.

The children of long-lived parents are, on the average, stronger, more vigorous, and longer-lived than the children of others; *and there are more of them per family.*

Here, then, we have evidence of the existence of a natural process at work among human beings tending to improve the vigor and vitality of succeeding generations.[1]

[1] The Genealogical Record Office, Alexander Graham Bell, Director, 1601 35th Street, Washington, D. C., will be glad to receive information concerning all authentic cases of persons now living who are more than 90 years of age. The data should include the date of birth of the individual, the age at which his or her parents died, and the number of children and ages of his or her children and direct descendants.

THE AZORES

Picturesque and Historic Half-way House of American Transatlantic Aviators

By Arminius T. Haeberle

Formerly American Consul at St. Michaels

THE picturesque Azorean archipelago, situated between the 37th and 40th degrees of latitude, lies in the path of steamers plying between New York and the Mediterranean, as well as in the course of those sailing between Panama and the ports of northern Europe.

The central cluster of this group, formed by the islands of Fayal, Pico, Sao Jorge, Graciosa, and Terceira, lies more than 840 miles directly west of Lisbon. About 150 miles northwest of this centrally located group are Flores and Corvo, and approximately the same distance to the southeast Santa Maria, and the largest and most important of all, St. Michaels (Sao Miguel).

The Azores are not, as is generally supposed, a colonial possession, but form an integral part of Portugal. For political and administrative purposes, they are divided into three districts, each sending its representatives to congress at Lisbon.

Owing to their location, the Azores have played a very important part in the history of sea navigation, just as they have within the last few weeks played a vital rôle in aërial navigation as the half-way house in the epochal transatlantic flight by American naval officers in the American seaplane NC-4, and as ports of safety for the equally daring aviators who piloted the less successful NC-1 and NC-3.

The keen interest that the Azoreans manifested in the first transatlantic flight had a deeper cause than mere curiosity. They remember that the first sailing ves-

MAP SHOWING THE THREE GROUPS OF THE AZORES AND THE ROUTES OF THE SUCCESSFUL AMERICAN AVIATORS IN THEIR TRANS-ATLANTIC FLIGHT; ALSO THE ROUTE CHOSEN BY THE ILL-FATED HAWKER-GRIEVE EXPEDITION

Photograph from U. S. Navy Air Service

THE CREWS OF AMERICA'S NC-1, NC-3, AND NC-4 BEFORE THEIR "HOP OFF" AT TREPASSEY BAY, NEWFOUNDLAND, FOR THE AZORES IN MAN'S FIRST TRANSATLANTIC FLIGHT

Reading from left to right: Lieutenant-Commander Albert C. Read, commanding the successful NC-4; Lieutenant E. F. Stone, of the U. S. Coast Guard; Lieutenant Walter Hinton, Special Machinist's Mate E. Harry Howard, Ensign Herbert Charles Rodd, Lieutenant James L. Breese, Commander John H. Towers, commander-in-chief of the flying flotilla and of the NC-3; Commander Holden C. Richardson, Lieutenant David H. McCullough, Lieutenant-Commander Robert A. Lavender, Boatswain Lloyd Ray Moore, Lieutenant Braxton Rhodes, Lieutenant-Commander Patrick N. L. Bellinger, commander of the NC-1; Lieutenant-Commander Marc A. Mitscher, Lieutenant Louis Theodore Darin, Lieutenant Harry Sadenwater, Chief Machinist's Mate Clarence Irvin Kessler, and Machinist Rasmus Christensen.

Official photograph, U. S. Navy Air Service

A VIEW OF TREPASSEY BAY, NEWFOUNDLAND, FROM ONE OF THE NC SEAPLANES: THE PORT OF DEPARTURE FROM THE AMERICAN CONTINENT FOR THE U. S. NAVY'S FLEET OF THREE FLYING BOATS BOUND FOR THE AZORES, PORTUGAL, AND PLYMOUTH

The Navy made elaborate provisions for its flyers in the establishment of bases of supply and repair at Halifax, Trepassey Bay, and in the Azores. In the foreground may be seen a tank steamer and two American destroyers. The supply ships of the seaplanes, the *Aroostook* and the *Prairie,* are anchored in the middle distance, up the bay.

sel that crossed the Atlantic, over four hundred years ago, landed at one of their islands. They were the first to receive from Columbus the news of the discovery of a new world, and they hailed with delight the opportunity to welcome to their shores the first man to win the title of "Columbus of the Air."

HISTORY OF THE AZORES

The discovery of Madeira, the Canaries, and the Azores Islands was a direct result of the persistent efforts of Prince Henry the Navigator, of Portugal, to double Cape Bojador and to discover a new route to India. It was during the glorious period of Portuguese explorations that Goncalo Velho Cabral discovered Santa Maria, the most southerly of the Azores, in 1432. In the course of succeeding years, covering a period of more than a decade, the other islands were discovered.

From that time on down to modern days the Azores, or Western Islands, became the scene of many an historic event. The first of these was the visit of Columbus on his return from America, in 1493.

Tossed about by a severe tempest, the great Italian navigator and his men made a vow that if their lives were spared they would worship, stripped of a part of their clothes, in the first church they reached. A few days later they sighted the Island of Santa Maria, where Columbus anchored and sent a part of his men to a small chapel near the shore to attend mass, in fulfillment of his vow. Today this chapel is one of the most interesting historical places on the island.

After the discovery of Brazil, the

Photograph from A. T. Haeberle

HORTA BAY WITH ITS BREAKWATER, THE CHIEF SEAPORT OF THE ISLAND OF FAYAL, WHERE THE NC-4 ANCHORED AFTER A RECORD-BREAKING FLIGHT OF 15 HOURS AND 13 MINUTES, AT AN AVERAGE SPEED OF 90 MILES AN HOUR

Through an enveloping fog, Lieutenant-Commander A. C. Read brought his seaplane safely into this port at 1:20 p. m. (Azores time) on May 17, after an all-night flight from Trepassey Bay, Newfoundland, the longest leg of the transatlantic air journey.

Azores were visited by ships plying between Portugal and South America. Vessels returning from the Western Hemisphere and from India, loaded with gold, silver, and spices, sought their way among the islands that became, in accordance with the turbulent spirit of the sixteenth century, the scene of many gallant fights for the ownership of these precious cargoes.

Those interested in the naval exploits of Drake, Sir Richard Granville, Frobisher, and other bold spirits of the sixteenth century, will find abundant romance in the early history of the Azores. Here they fought with vessels of the Spanish Armada of Philip II, and it was here that the U. S. privateer, *General Armstrong,* was sunk in the harbor of Fayal during the war of 1812.

Today the Azores are important as a coaling station for vessels engaged in peaceful commercial pursuits.

ORIGIN OF THE AZORES ISLANDS

Although much has been written about the origin of the islands, this is still a matter of conjecture. Interesting arguments have been advanced to prove they are remnants of the lost continent, Atlantis. One theory is that the islands are the topmost peaks of a subterranean range of mountains extending north and south, and another that they were at one time a part of the continent. English geographers have taken a deep interest in the study of the islands, and it is not improbable that botanical investigations will prove that the latter theory is correct.

But whatever may have been the origin of the islands, they are certainly the result of tremendous volcanic eruptions that have continued to change their physical aspect ever since their discovery in the fifteenth century. On every hand are evidences of former upheavals, from the gray lava stones that are used in the construction of houses and the building of roads to the underlying streaks of ashes that are visible in places where the surface soil has washed away, and the many cup-shaped craters and beautiful lakes on the tops of the mountains.

According to a Moorish account, written before the thirteenth century, an Arabian caravel started from Portugal to discover new lands. Sailing westward for eleven days, the sailors suddenly found themselves in a sea of "fetid gases" and confronted by dangerous rocks and shoals, which so frightened them that they turned southward. It is quite possible that these daring Arabian sailors reached the Azorean waters during a volcanic disturbance, which prevented their further discoveries.

It is most interesting to compare with this account a strange phenomenon that is described in the early archives of the Azores Islands in connection with the discovery of St. Michaels. Upon leaving the shore of this newly found land, the discoverer made a sketch of the island and noted especially the presence of two peaks that towered high above the others, one on the eastern and the other on the western extremity.

Soon afterward, he returned from Portugal to establish a settlement, but when he approached the island he was surprised to find that during his absence the western peak had entirely disapppeared. Trees and large quantities of pumice-stones were seen floating in the sea. Today the town of Sete Cidades, built in the hollow of a crater, marks the site of the old peak.

The violent earthquakes that disturbed the Azores during the succeeding centuries down to the eighteenth are too numerous to mention. But the annals of the islands vie with those of Italy in graphic accounts of the ever-interesting and terrible volcanic phenomena. Cities were buried, mountains disappeared and sent their ashes to unbelievable distances; islands hundreds of feet high suddenly appeared and as suddenly disappeared, and flames of fire illuminated whole islands and their intervening waters.

Pico, 7,613 feet high, on the island bearing the same name, is interesting as the central and the highest volcano of the islands. It is considered by some as the principal communication of this region with the interior of the earth. Light clouds of vapor occasionally rise from its summit and the ashes at the top are still warm.

St. Michaels has perhaps suffered more from volcanic disturbances than any of the other islands; but Santa Maria, only

Photograph from A. T. Haeberle

THE VOLCANO OF PICO AS SEEN FROM FAYAL, THE WESTERNMOST ISLAND OF THE CENTRAL GROUP OF THE AZORES

Rising to a height of more than 7,600 feet, Pico is the loftiest peak of the Azores. The soil of the island of the same name is composed of pulverized lava, which until a little more than half a century ago produced a famous wine. A fungus destroyed the vines in 1852, however, and since that time the inhabitants have raised figs and apricots.

53 miles south of St. Michaels, has always been free from eruptions and even heavy earthquakes.

AZOREAN EMIGRATION TO THE UNITED STATES

There is perhaps no country in the world that has such a heavy tide of emigration, in proportion to the number of its inhabitants, as the Western Islands. Some of the emigrants go to Brazil, but by far the majority to the United States. During the year before the world war 6,000 Azoreans emigrated to the United States, and it is estimated that there are 35,000 Azoreans in California and over 60,000 in New Bedford, Massachusetts, Providence, Rhode Island, and other parts of New England, making a total of almost 100,000. The population of all the Azores is scarcely 300,000. Many of the emigrants return home, and almost all of the inhabitants of some of the islands have been in the United States.

It is not unusual, even on the small islands, remote from foreign influence and the busy world of the twentieth century, to hear a boy of 17 discuss his contemplated trip to Massachusetts, a gray-haired señor speak of the bark *Sarah* that carried him to American shores in 1850, or an aged mother refer to her son in the far-off land of California.

Most of these emigrants sail from Ponta Delgada, the capital of St. Michaels, where they gather from all the islands. Two Portuguese steamers make their monthly rounds to the various Azorean ports, bringing back to St. Michaels old men who have visited relatives and are now returning to America, and young men and young women, boys and girls, about to seek their fortunes in the New World.

Those are busy days in the port of St. Michaels. On first view, the Azorean emigrants, gathered on the wharf, differ little from those of other countries; but an opportunity to study them more closely will reveal many interesting faces and figures. These peasants have lived in a healthful, mid-ocean climate and led their simple lives among the hills and rugged mountains of their native land. Dejection is not pictured on their faces. Many of them are tall and strong. But perhaps the most notable feature to a stranger is the healthy glow of their faces.

Unfortunately, many do not find the fortune they seek in America. Some go to the western part of the United States and continue to lead a healthful life on the ranches in California and Nevada, but others seek employment in the manufacturing centers of the eastern States.

Not accustomed to the cold climate and indoor work, or the result of denying themselves some of the necessaries of life in order to accumulate enough money to return home, it sometimes happens that they contract consumption. While this is by no means the rule, the government of St. Michaels has, in connection with its hospital, a special department for those afflicted with this disease.

ST. MICHAELS—"A VISIT TO PARADISE"

"You are going to a paradise," was the information I received from a friend when he heard of my contemplated trip to the Azores. Naturally, my expectations ran high. Unfortunately, when our boat anchored off St. Michaels, February clouds, sending down sudden squalls, were hanging low over the hills. But, even with high expectations and the interference of low clouds, the scene was not disappointing.

A sudden burst of glory is not essential for a terrestrial paradise. St. Michaels does not overwhelm you with the grandeur of a Rocky Mountain scene. It captures you subtly. Little by little impressions pile up in your memory until your fancy lingers in the beautiful gardens, whose walls are covered with wisteria and climbing roses, in the magnificent parks, and among the extensive hedges of hydrangea that bloom along the country roads.

By way of contrast, St. Michaels will fret and frown amid fearful, stormy seas. But you are compensated when, on a sunny day, you stand on the summit of one of the many peaks and behold the tranquil scene below you. Then you will see the island studded with towns and villages, the verdant hills laid out in checkered fields and cultivated to the very tops, picturesque dome-like windmills turning their long wings, and the harbor and sur-

Photograph from A. T. Haeberle

PANORAMIC VIEW OF PONTA DELGADA, ST. MICHAELS, AZORES: FROM THIS HARBOR THE NC-4 BEGAN THE FINAL LEG OF ITS EPOCHAL TRANSATLANTIC FLIGHT

This was also the port of refuge into which Commander Towers piloted, under its own power, the crippled NC-3, after a remarkable sixty-hour battle with a storm-tossed sea.

rounding ocean dotted with sails that glisten in the bright sunshine.

PONTA DELGADA, THE MID-OCEAN TERMINAL FOR AVIATORS

Ponta Delgada, the largest city in the Azores, has 17,600 inhabitants. Fortunately, it has preserved some of its old features, the inheritance of past centuries—just enough to breathe an atmosphere of quaintness and to make the place so delightfully attractive that the jumble of high, massive chimneys, the tall walls, and the small balconies that overhang the streets become a part of one's life.

Modern buildings there are, such as the imposing hospital, the quarantine station, the Governor's Palace, and many private residences. But it is not these one cares to talk about in a place that can boast interesting relics of the past.

Ponta Delgada still has a number of houses that have been handed down through generations in accordance with the law of the morgados. The morgado was the oldest son, who inherited the estate of his father and upon whom devolved the duty of providing for the other members of his family.

The architecture of these houses is the same as that used in olden times by the morgados of northern Portugal. Here they are built of massive lava rock. The interiors are divided into spacious rooms, provided with many windows and doors that often connect with long rows of balconies. Ornamental designs worked in plaster of Paris decorate the painted walls and ceilings. Large chimneys stand like sentinels on the roofs. These chimneys, having long, narrow openings, are in some cases eight feet wide at the lower part, where they rise from the fireplace in the kitchen.

The date showing when the house was built and a coat of arms made of plaster of Paris are sometimes found above the entrance. Many of the morgado residences are provided with a special chapel for the members of the family. The best

Photograph from A. T. Haeberle

THE TYPICAL THICK-WALLED, THATCH-ROOFED COUNTRY HOUSE OF THE AZOREAN PEASANT: NOTE THE CORN STACK TO THE LEFT

These peasants live in a healthful, mid-ocean climate and lead simple lives among their hills and rugged mountains.

example of this class of architecture in St. Michaels is the old palace of Santa Catharina.

Back of the houses are flower gardens surrounded by high walls. These walls, sometimes 15 feet high, are found everywhere on the island, often inclosing the roads for a long distance. Some writers have attributed these walls to the necessity for fortification against foreign invaders in the early days of the island, but in reality they were built to protect the orange groves from the wind. Next to the walls, Faya, or beech trees, were planted as a further shelter. Like the houses, these walls are made of lava stones, skilfully piled on top of each other and the crevices filled with small pieces.

THE ROMANTIC STORY OF THE CHURCH OF HOPE

Many of the gardens have high stone towers that command a view of the sea and surrounding country.

There are several historical churches and convents in Ponta Delgada, of which the Church of the "Colegio" and the Church and Convent of "Esperança" are of greatest interest. The former was built by the Jesuits in 1625. When, in 1760, the Jesuits were expelled from the Azores during the reign of Don José, this church and the adjoining property were sold at public auction. In this way they came into the possession of one of the principal families of St. Michaels. Although a private church, it is open to public worship. The architecture is that of the Jesuit churches of the fifteenth and sixteenth centuries. The Colegio Church is frequently visited by tourists because of the elaborate wood carving of the interior.

But the church that holds the foremost place in the hearts of pious Azoreans is "Esperança," or Church of Hope. It is the abode of their most devoutly worshiped image, "Santo Christo," the origin of which dates back to the founding of

Photograph from A. T. Haeberle

AT A VILLAGE FOUNTAIN AND PUBLIC BATHTUB ON THE ISLAND OF ST. MICHAELS: THE AZORES

"St. Michaels is a little world in itself and the Azoreans have a little of everything." From the red volcanic clay to be found on the islands the natives make artistic pottery, examples of which are seen here as porous water-jars, which keep the water cool.

Photograph from Emil P. Albrecht

WE ARE NOT IN A MOHAMMEDAN LAND OF VEILED WOMEN, BUT THE EFFECT IS ALMOST THE SAME IN THE AZORES

When clasped at the throat, as the cloaks are meant to be, there is but a tiny strip of the wearer's face visible, and that only from directly in front. A street scene in Ponta Delgada, the flourishing capital of the Azores archipelago.

Photograph from A. T. Haeberle

CORN STACKS IN THE AZORES RESEMBLE GIGANTIC BUNCHES OF BANANAS

Much of the land of the islands is controlled by wealthy land-owners, who lease it and collect an annual rental of from $5 to $15 on each "alqueire," the Portuguese unit of land measure in this district, which is less than the American acre. The Azores must have had their St. Patrick as well as Ireland, for there is only one species of reptile, a lizard, indigenous to the archipelago.

the convent connected with this church. No one can remain long in St. Michaels without becoming acquainted with the truly important part this image plays in the religious life of the people—a worship peculiar to the island of St. Michaels.

In the sixteenth century twenty-seven nuns founded a convent in Caloura, a small town in the southern part of the island. Eighteen of these, fearing the ravages of Moorish invaders, entered the more securely protected convent in Villa Franca, the old capital, while the less timid decided to remain at Caloura.

Two noblemen of that town, feeling compassion for the faithful nine who refused to leave, undertook to raise sufficient money to build a convent in Ponta Delgada.

Two of the nuns were sent to Rome to make the necessary arrangements with the Pope. They brought back not only the desired permission to found a new convent, but also the image of Ecce Homo, or Santo Christo, which was placed in the new convent upon its completion, in 1541.

Years ago the Portuguese Government abolished all convents and prohibited women from taking the vow. But the Convent of Esperança was placed in the hands of a religious society and allowed to remain open under the auspices of an abbess. Today about forty women live there, performing their religious duties, but free from the usual vow and strict rule.

Many of the inmates of Esperança earn their living by making confectioneries that have become famous in the island.

TWO FAMOUS FESTIVALS

The procession of Santo Christo takes place on the fifth Sunday after Easter. In the afternoon of the day before, the image is taken out of the convent, where it remains all year. It is carried into the adjoining church, which is kept open all night for the 15,000 people who come from far and near, many of them from other islands, to worship and witness the great procession of the year. The pilgrims walk long distances, and make their beds in the park in front of the church or sleep in the vestibule itself. Nor do the faithful worshipers in the United States forget their beloved image. Generous contributions arrive from America, and, in remembrance of absent friends, the American flag is produced in the form of pyrotechnical displays in the Park of San Francisco.

Santo Christo is often spoken of by the islanders as being "rico," * or rich, which is certainly true; it is impossible to estimate his wealth; but the costly jewelry and precious stones that have been offered at his shrine and with which he is adorned represent a value of thousands of dollars.

The second of the great religious festivals is the Imperio do Espirito Santo, or Holy Ghost, which extends over a period of ten or more weeks, from Easter Sunday until Saint Peter's Day. The season is marked by a series of processions, but the principal and most interesting feature is the poor people. On the last Sunday mordomos, or chiefs, whose duty it is to collect money and other gifts, are selected for the ensuing year.

A SEASON OF CHARITY

Generous quantities of flour, wheat, beans, and cattle are frequently received from those whose fortunes enable them to bestow freely. The money is used to purchase wine and food.

During the Espirito Santo holidays the wheat and flour are converted into bread, the cattle are killed, and everything is distributed among the poor. The residents of certain streets form so-called imperios, or unions, each one electing its mordomo and distributing the collected gifts among its members. The food is placed in carts drawn by oxen, and both carts and animals are decorated with garlands and rosettes of bright flowers.

The festivities of Santo Christo and Espirito Santo are eventful days for the inhabitants of the rural districts, who think little of pleasure during the year. The husband or father leaves his home at daybreak to till the soil, while the female members of the family attend to their domestic duties, carry their corn to

* This term is used in a *most respectful manner* by the Azoreans.

Photograph from Emil P. Albrecht

A MODISTE WOULD STARVE IN THE AZORES—FASHIONS NEVER CHANGE

The cloaks worn by the women last a generation at least; sometimes several. Granddaughter dons grandmother's apparel without chagrin and without causing comment when she appears on one of the main thoroughfares of Ponta Delgada.

the nearest windmill, and bring back the meal for the week.

Mass on Sunday morning and a walk or visit in the afternoon constitute, in many cases, the only change in their simple lives until the approach of the festivities of Santo Christo and Espirito Santo. Then the men take out their violins, guitars, and accordions and lead their families to Ponta Delgada to worship, to see the decorations, and to sing and dance.

The native dances are on the order of our square dances, men and women winding in and out, with slight variations, according to the figures of the different dances. If the father is a musician, he will play his violin as he walks along the country road. It is an interesting sight to see a whole family marching home to the tune of lively native melodies.

One of the churches is situated on a high elevation and affords a perfect view of the city, harbor, and surrounding country. The real name of the church is "Mae de Deus" — Mother of God. When Colonel Roosevelt stopped at this island on his journey to Africa, he visited this spot, since then called Roosevelt Park. A tablet on the church bears the Portuguese inscription, "Passeio Publico Theodore Roosevelt."

CARNIVAL TIME IN THE AZORES

It was my good fortune to arrive at St. Michaels in time to witness the carnival festivities. Two Sundays are devoted to amusement during this time. Wax balls, called "limas," are filled with water and used to bombard people who may venture within range. Formerly, these balls were thrown promiscuously, but now certain places are set apart for that purpose. One may walk with safety through the city on carnival days, but if a person ventures near the happy revelers, he does so on his own responsibility.

The most attractive feature of carnival time is the "Battle of Flowers" in the square of San Francisco. Those wishing to participate prepare their coaches for that purpose, covering them with elaborate floral designs. Since the introduction of automobiles, these are also used, the bodies and wheels of the cars often forming solid masses of flowers and oranges.

The coaches are loaded with baskets full of flowers and confetti. Soon the street and park become a solid mass of people, and the progress of the vehicles is obstructed. Then the battle begins and rages everywhere until the battlefield is covered with a thick carpet of flowers and confetti, and the immaculately dressed women and girls, flushed with the exciting hardship of attack and defense, present a fascinating picture.

Photograph from A. T. Haeberle

AN AZOREAN PEASANT FAMILY ENTERING PONTA DELGADA TO PARTICIPATE IN THE FESTIVITIES OF SANTO CHRISTO

As they march along the road they sing native melódies to the accompaniment of guitar, accordion, and violin. Note that all the men of the family are barefooted.

PONTA DELGADA'S WONDERFUL GARDENS

Ponta Delgada has some of the most wonderful botanical gardens in the world. They have been pronounced by some as ranking next to those in Portugal, and by others as inferior only to the famous gardens of Brazil. That of José de Canto was begun in 1848. Señor Canto was connected with all the different nurseries in the world, and it was his ambition to gather specimens of all the trees and plants that could be obtained. The result is a marvelous collection.

The gardens contain tree ferns originally from Australia, many species of palms (such as the date, sago, and fan), Australia myrtle, great varieties of aloes, magnificent roses and camellias, India-rubber trees, banyan trees, acacias, magnolias, dracenas, brilliant red flame trees, screw-pines, and fine specimens of the cedar of Lebanon.

The dragon trees (*Dracæna draco*) grow well, and at Praia, in the southern part of the island, there is a long avenue of them. This species is exceptionally interesting because of the famous dragon tree of Orotava, on Teneriffe, that existed until 1867. Humboldt estimated its age at 10,000 years. It is said to have been so large that ten men with arms outstretched could scarcely surround it.

St. Michaels does not distinguish itself because of rare flowers. It is rather the

Photograph from A. T. Haeberle

THE PROCESSION OF SANTO CHRISTO IS PONTA DELGADA'S NEW YEAR'S, LABOR DAY, AND FOURTH OF JULY ALL IN ONE

The celebration takes place on the fifth Sunday after Easter, and the inhabitants of St. Michaels walk long distances to the capital, where they make their beds in the park in front of the church or sleep in the vestibule itself the night before the eventful day (see text, page 527).

great exuberance with which they grow when introduced and their splendid development that surprise. Riding through the country, one will suddenly find himself among hedges of hydrangea and incense (*Phetu lacca undulata*). Here the white calla lily, the pink belladonna lily, the bright Guernsey lily, fresias, rambling Dorothy Perkins, wisterias, begonias, and gladioli blossom in indescribable profusion.

Years ago the Easter lily was raised for export. The flower grew so well that millions were planted, but the extensive fields were suddenly destroyed by a disease, and fortunes were lost. Owing to

Photograph from A. T. Haeberle

THE "ROOSEVELT CHURCH" AT PONTA DELGADA, ST. MICHAELS: THE AZORES

Its real name is "Mother of God"; but when Colonel Roosevelt was on his way to Africa he visited this spot, which has since been called Roosevelt Park. A tablet on the church commemorates the event.

the destruction of this flower, of the orange trees and the vineyards, years ago, the government now maintains an agronomer's station to examine all plants brought to the island.

"THE CAPOTE AND THE CAPELLO"

The handkerchief still forms the principal head covering of the older women of the peasant class, while the younger wear fancy scarfs. Wooden shoes are also worn by many of the peasant women and servants. The old carpauça, with its cape falling over the shoulders to protect the neck from the cold, is not used as extensively by the men as in former years, but the tasseled cap used by the laboring class is often seen in the streets of Ponta Delgada.

In the cities many of the women wear a special garb known as the "capote and capello." The capote is a long blue cloak, to which is attached the large bonnet-shaped hood known as capello, which completely hides the face, extending far out in the front and back. This costume is not found elsewhere in Portugal.

The Portuguese land measure is called "alqueire," which is less than the American acre. Much of the land of the islands is controlled by wealthy land-owners, who lease it and collect an annual rental of six milreis to twenty milreis, or about $5 to $15 in United States currency, on each alqueire. The rent is generally paid in money, but sometimes in the products of the field. One man often leases from 20 to 30 alqueires.

MILKMEN SLEEP IN CAVES

Although emigration has affected, to some extent, the cultivation of farm lands, the owners can profitably use the unoccupied parts for grazing purposes, as there is a good market for cattle. This pasture land is also rented out. In winter,

Photograph from Emil P. Albrecht

ON THE QUAY AT PONTA DELGADA

Through the archway to the left can be seen the entrance to the arcades of the Casa des Arcas, which faces on the inner harbor. The woman in the foreground wears the familiar "capote and capello."

when the cattle graze in the fields, the rent is based upon the alqueire; but in summer, when they are driven to the hills, where the land is not measured, the charge is based upon the size of the herd.

The men who attend to the milking go up into the hills in the evening, where they sleep in caves, in order to round up the cows early in the morning and milk them. The milk is then taken to town in large tin cans packed on burros.

Fields of broad beans and lupine are everywhere in evidence. These products are used as fertilizers. Walls of lava stone divide the green fields into small squares, giving the hills a characteristic checkered appearance.

HOTHOUSES HEATED BY FERMENTATION

Formerly, oranges were the principal article of export, and in 1872 300,000 boxes were shipped abroad, representing a value of about $500,000. From that time on the orange industry gradually declined, as a result of the destruction of the trees by disease, and agriculturists turned their attention to the growing of pineapples.

The first pineapples were grown in a small town, Livramento, but now the principal centers are Ponta Delgada and Villa Franca. The fruit is not planted in fields, as in the warmer climates of Mexico and Central America, but carefully nursed in hothouses, without artificial heat. To produce the necessary heat, beds of special fermenting material are made. The hothouses, approximately 40 by 90 feet, face north and south and contain as many as 3,000 plants. The young pineapples need replanting, and therefore several hothouses are used before the fruit is ready for market.

In the first house the earth is prepared by covering a heavy layer of small branches with soil that has been previously used. This is turned over and watered.

The young plants are placed about a foot apart and covered with a layer of loamy soil. After being carefully watered, they are allowed to remain undisturbed for about 12 weeks. When they appear above the ground the glass roofs are covered with a coat of whitewash to soften the light of the sun.

The plants are transplanted to the second hothouse after they have reached a height of about six inches. The beds in the second hothouse consist of three layers, the bottom one being old soil that has been used in the hothouse; the second, new earth; and the top, a thoroughly rotted hothouse soil. The plants are placed two feet apart and allowed to grow until they are one foot high.

Then follows the interesting process of smoking the plants. This method is the result of an accidental discovery. Years ago the furnace in one of the hothouses began to smoke and filled the entire house with fumes. The planter believed that his crop was ruined, but discovered later, to his surprise, that all his plants not only matured more quickly, but also simultaneously. Since then it has been learned that pineapples requiring several years to mature under the old system will show signs of bearing forty days after being smoked, and then mature more evenly.

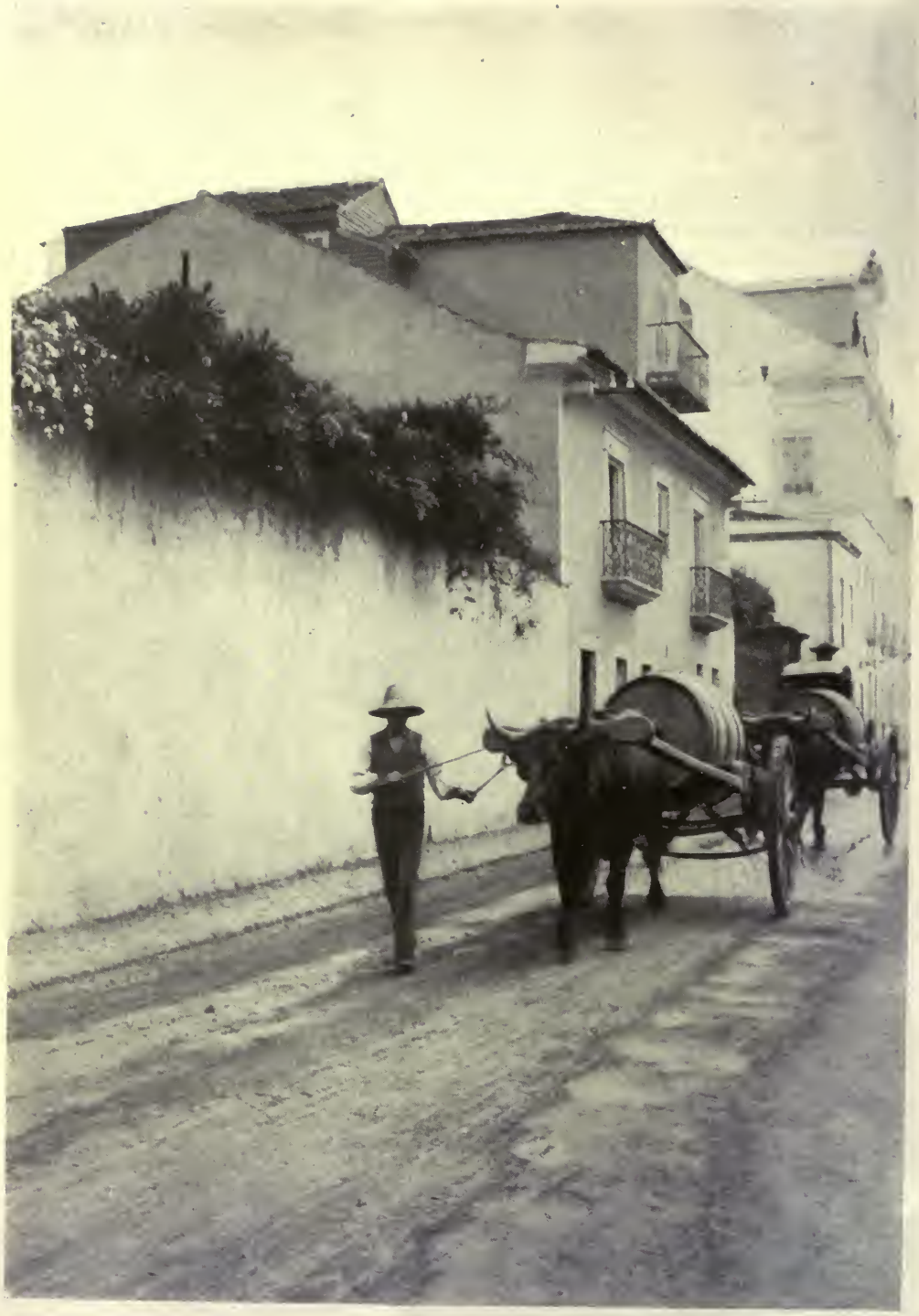
The furnaces used for smoking are filled with green grass or foliage and allowed to smoke three nights in succession. The plants mature in about one year from the time of planting.

The average cost of producing one pineapple, packed for export, is about 24 cents. While this is expensive, the fruit is remarkably free from all fibrous substances. The pineapples are packed in excelsior and shipped to England on fruit boats devoted especially to this trade. The pineapples raised in St. Michaels sell for four and five shillings apiece in London.

A GREAT WINE COUNTRY

The second great industry of St. Michaels is the manufacture of wine. It sometimes happens that the crop is so great that there are not enough pipes on the islands to hold the wine, and growers have to build special cement tanks.

Several kinds of sweet and sour wines are manufactured, but that most widely used is a red wine (vinho de cheiro). It contains a very small percentage of alcohol and has a rich grape flavor. A liter of this pure wine is sold for 60 reis, or about five cents in American currency. It is almost impossible to become intoxicated on this "vinho de cheiro," and



Photograph by Emil P. Albrecht

OX-DRAWN WATER WAGONS OF THE AZORES

Over the creamy or soft gray walls of gardens billows of flowering vines droop down, purple and crimson and yellow.

Photograph by A. T. Haeberle

THE THERMAL SPRINGS OF FURNAS VALLEY, NEAR PONTA DELGADA, BESPEAK THE VOLCANIC ORIGIN OF THE AZORES

Here the waters seethe and boil and send up clouds of smoke, as in the geyser region of the Yellowstone. This is the Aix-les-Bains of the Azorean archipelago, with numerous bath-houses for invalids afflicted with rheumatism and palsy.

drunkenness among the people of the island is rare.

The island of St. Michaels is mountainous, but less precipitous than most of the others. That the hills can be so successfully cultivated is due to their even, well-rounded outlines. But three of them are old craters, with beautiful lakes and picturesque valleys—one in the eastern part, known as Furnas; one in the center, the Lagoa do Fogo, or Fire Lake, and another in the western part, Sete Cidades, or Seven Cities.

ST. MICHAELS' FAMOUS SUMMER RESORT

A description of St. Michaels would be incomplete without a visit to Furnas and Sete Cidades. A great number of towns and villages follow the coastline of the island, nestling peacefully among

Photograph from A. T. Haeberle

AZOREAN WHALERS USED AMERICAN METHODS IN PURSUING THEIR QUARRY WHEN THIS INDUSTRY FLOURISHED ON THE ISLANDS A FEW YEARS AGO

At Capellas, on the island of St. Michaels, a lookout was maintained on one of the near-by peaks, and whenever a whale was sighted a signal was given to the men waiting in the boats below. The direction was indicated by two signal fires built in line with the spot where the game had been seen to "blow." Here the whalers are seen hauling the dismembered carcass of their catch up on the beach by means of capstans.

the hills and valleys. Passing along the southern road to Furnas, clusters of white houses appear unexpectedly, disappear, and reappear above or below, as the road winds over the hills.

Twenty-seven miles from Ponta Delgada lies Furnas Lake. Its beauty is enhanced by a chapel of Gothic architecture on the southern shore that seems to add to the stillness of the place. A short distance beyond is the valley of Furnas, inclosed by steep mountain walls.

This valley marks an important spot in the history of volcanic disturbances of past centuries, and contains a number of important thermal baths, the waters of which boil and seethe and send up clouds of smoke. To appreciate the full beauty of the valley, the foremost Azorean summer resort, it is necessary to look down upon the town and lake and opposite mountain ranges from the heights of the northern road that descends into the old crater, where today the town of Furnas is located.

There is a charming spot in the valley of Furnas called "Tanque." This park is of interest to American readers, for it was there that the historian Prescott spent a part of his time during his stay on this island. Prescott came to St. Michaels to visit relatives, and to this day his Azorean kindred, both English and Portuguese, cherish his memory.

HOW THE SIGHT-SEER TRAVELS IN THE AZORES

When people go to Sete Cidades they pray for a fine day, for that is one condition—a perfect light to play upon the picture. We were fortunate enough to have the best of weather. A coach drawn by three horses took us to the little town of Lomba da Cruz in less than two hours. There we exchanged the vehicle for donkeys and mounted in native fashion.

The saddle used by the peasants is a heavily cushioned frame, provided with elevated cross-pieces in front and behind. The rider mounts sideways and may grip these cross-pieces like the sides of a chair. The first sensation is somewhat startling, but after a little practice this way of riding is not unpleasant.

A muleteer accompanied each donkey and supplied all the life and energy which donkeys the world over lack. "Chega la!" "Chega-te asno!" they shouted in a singing tone, with a long, drawn-out accent on the penult. The ascent is steep, but with the aid of many a "Chega la!" we steadily climbed toward the top amid ferns, heather, and tulip trees.

A MARVELOUS PICTURE FROM THE EDGE OF A CRATER

After dismounting, we were asked to close our eyes and be guided to a place overlooking the entire scene. A picture should be unfurled quickly. Perhaps this added to the effect. When we opened our eyes we found ourselves standing on the edge of a ridge 2,000 feet above the old crater that had puzzled the discoverer of the island centuries ago.

On the north and east steep mountain walls, rising to a height of 1,700 feet and covered with green trees, encircle the crater and reflect their hues in the clear waters of the lake below. The two round lakes are known as "Lagoa Grande" and "Lagoa Azul." Although they are connected, each retains its distinctive color—the one a beautiful blue; the other a green. Folk-lore attributes this phenomenon to the girl who jumped into one lake, which assumed the color of her petticoat, while her parasol, dropping into the other, changed the color of the smaller body of water.

On the western edge of the lakes is the small valley, with summer residences, and the village of Sete Cidades, which looks like a town in miniature when viewed from the top of the mountains.

The mountains are lower in the northwest, where the lava flowed down the mountain side during the eruption.

As I looked into the valley, I recalled the scene on the "Lookout Mountain" of Juan Fernandez, the old Robinson Crusoe Island, where Alexander Selkirk had scanned the ocean in search of a vessel that might take him away from his solitary abode. Here was the same view of the ocean on both sides. I recalled scenes in the Andes of South America and glimpses of the beautiful Honduran valley of Cantaranas from the top of San Juancito ridge, 6,000 feet high. But none of those was so beautiful a picture. They were simply fragments of the great

Photograph from H. T. Haeberle

THE WATERS SURROUNDING THE AZORES TEEM WITH MANY VARIETIES OF EDIBLE FISH

The sea furnishes a livelihood for a considerable proportion of the Azorean population. Thousands of lobsters are exported to Europe.

world the eye desired to reach but could not. They left one wondering what was beyond. But Sete Cidades is a complete painting, placed in a wonderful frame—the painting of a little village among the pines, resting peacefully on the edge of two beautiful lakes. That is all!

A LITTLE OF EVERYTHING

"We live happily. We have a little of everything on this island," remarked a resident of this city.

He was right. St. Michaels is a little world in itself, and the Azoreans have a little of everything. They raise their own wine and tea and have their own mineral water and thermal baths; they have their own tobacco and manufacture their own cigars; they cultivate large quantities of sugar-beet and manufacture their own sugar. The rich volcanic earth and humid, but healthful, climate lend themselves to the cultivation of great varieties of agricultural products, including vegetables and fruits of the temperate and tropical zones. Twenty-one thousand head of cattle graze in the hills and help to form one of the principal industries of the islands, the manufacture of cheese.

The sea furnishes a livelihood for a large number of its inhabitants. Thousands of lobsters are exported to the Continent.

The island is covered with a network of roads, over which 150 automobiles travel for pleasure and business.

In the year before the war St. Michaels' exports were valued at $1,839,954. For a small island home, 41 miles long, this is a record worthy of note.

HORTA A CABLE CENTER FOR THE WORLD

Santa Maria, the second island of the eastern district, is much smaller than St. Michaels. On a clear day its outline may be discerned from St. Michaels. Villa do Porto, on the Bay of Santa Luzia, is the largest town. This island furnishes much of the red volcanic clay that is used in the manufacture of all kinds of pottery, such as the porous water bottles that keep the water cool, vases, jars, and other receptacles, some of which are very artistically designed. The mountains of this island range from 1,700 to 1,900 feet.

Of the central group, Fayal is the most important. The city of Horta is the principal port. It has a well-protected harbor and is the great cable station of the Atlantic. Nine cables connect the Azores with all parts of the world. A message has been sent around the world from New York via Horta in 11 minutes.

The lace workers of Fayal are famous for their skill in making a beautiful drawn work called "crivo."

The patterns of animals used 60 years ago came from Brazil and are of primitive, medieval design. One lace expert stated that these designs date back to the fourteenth century. They were probably carried from Portugal to Brazil in the sixteenth century. But the Brazilian meshes were coarser than the present crivo work, which has extremely fine meshes.

These meshes, forming the groundwork into which the patterns are woven by hand, are always square. They are so fine and the work so delicate that it takes four months to make a five-inch border for a piece one yard square. Today promiscuous patterns are used as well as the old animal reproductions.

SPANISH INFLUENCE SEEN IN TERCEIRA

The islands of Pico, Terceira, Sao Jorge, and Graciosa lie close to Fayal. Pico is separated from Fayal by a narrow channel, only five miles wide.

Terceira is the most interesting of this group from an historical point of view. A naturally fortified place, Angra, the picturesque capital, was the central point of battles and political disturbances of bygone times. The castle of S. João Batista, the old Spanish fortification built on the slope of Monte Brazil, is an interesting relic of the seventeenth century. The massive walls of this castle extend down to the sea front and to the edge of the city.

To this day Terceira shows traces of the domination of Spain over Portugal in the latter part of the sixteenth and the first half of the seventeenth centuries The short jacket, tight trousers, and Spanish style of hat distinguish the inhabitants of Angra from those of the other islands.

Photograph from A. T. Haeberle

THE MODEST HOTEL AT SETE CIDADES, ST. MICHAELS, WHERE THE PRINCE OF MONACO AND THE LATE KING LEOPOLD OF BELGIUM WERE ENTERTAINED DURING THEIR VISITS TO THE AZORES

The village of Sete Cidades clings to the western shores of two tiny lakes—Lagoa Grande and Lagoa Azul. The waters of one are blue; those of the other, green. Legend says that the green lake owes its color to the petticoat of a girl who jumped into it, while her blue parasol fell into the other.

Photographs from A. T. Haeberle

THE PERIPATETIC WATER-COOLER OF PONTA DELGADA

A drink from one of these jars is always refreshingly cool, for the pottery is of the porous variety, which causes rapid evaporation.

SELLING SIEVES IN ST. MICHAELS

This Azorean peddler's pack is a lighter load than that of the hat-laden vender of the Philippines (see illustration, page 495).

AN AZOREAN DRAY AND ITS LEADER

Photographs from A. T. Haeberlè

THE TASSELED CAP, WORN BY THE LABORING CLASS, IS OFTEN SEEN IN THE STREETS OF PONTA DELGADA: AZORES

This genial barefooted native is a fruit vender. The wicker hampers borne by his donkey contain many varieties of semitropical fruits, including figs, oranges, bananas, pomegranates, lemons, grapes, apricots, and perhaps a few of the delicious hothouse pineapples for which the islands are famous and which sell in the London markets for four or five shillings each. Note the Chinese lanterns which festoon the trees, indicating that this is the Espirito Santo festival season.

Photograph from A. T. Haeberle

A FIELD OF EASTER LILIES IN THE AZORES

Years ago these flowers were raised by the millions for export, just as they are now an important source of revenue for the people of Bermuda. The bulbs were suddenly stricken with a blight, however, and fortunes were lost by the Easter-lily growers.

The Spanish pastime of bull-fighting was also introduced, and still exists, but in so modified a form that the bull-fights of Terceira are quite unlike those of other places. It is a sport not for the people, but by the people. When the bull charges, men and boys scramble up the walls and windows and disappear in the open doorway. A rope is attached to the horns of the bull to check, if necessary, the progress of the infuriated animal.

THE CORVO COW A "SHETLAND" VARIETY

Corvo is the smallest of the Azorean islands. It is so small that it looks like the very tip of an old volcano peeping out of the water. It is the home of less than a thousand souls, who live in almost complete isolation, for the Portuguese vessels call there only once every three months, and even then will sometimes forsake it when the weather is too rough to land. A lake has formed in the crater, called "Caldeira," containing nine small islands, that look as if they might be a miniature reproduction of the Azorean archipelago. The Corvo cow has developed in proportion to the size of its home. It is a neatly formed little animal, not much more than three feet high when fully developed, but is a good milcher.

Corvo now has a wireless to save it from complete separation, but years ago the inhabitants built bonfires on its southern shores when they desired to communicate some urgent message to their neighbors on the island of Flores.

The island of Flores is the second of the northeastern group. It is about three times the size of Corvo. Many of the towns are built against the cliffs that rise abruptly out of the water.

The coast of Flores is full of treacherous shoals that often tax the skill of the Azorean sailors to the utmost. Several years ago the *Slavonia*, of the Cunard Line, was driven in a dense fog on the rocks of this island and hung for a long time with her bow fastened to the shoals on the very edge of great depths. When

BOTH SHEEP AND GOATS TAKE THE PLACE OF BELGIAN DOGS BETWEEN THE SHAFTS IN THE AZORES

Note the lava rock of which the houses are constructed. It is the cheapest building material available in the mid-Atlantic islands.

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LISBON FROM THE BAY OF TAGUS, CONTINENTAL SEAT OF GOVERNMENT OF THE AZORES AND THE PORT WHICH MARKED THE COMPLETION OF MAN'S FIRST TRANS-ATLANTIC FLIGHT, ACCOMPLISHED BY AMERICAN NAVAL AVIATORS

The capital of Portugal, which had a population equal to that of Washington before the war, is rated by travelers the most beautiful city in Europe, Constantinople and Naples alone excepted. A Portuguese proverb runs, "He who has not seen Lisbon does not know what beauty is."

she was finally lifted off by a heavy wave, caused by a passing steamer, she sank in only a few fathoms of water and may be seen today from the precipices above.

The Azoreans are good sailors. Although the sea between the islands is very rough at times and navigation very hazardous, their small boats are seen everywhere, even among the dangerous rocks, plying between the various islands.

Extensive trade in cattle and dairy products is carried on not only between the islands, but also between the Azores and Lisbon.

THE FUTURE OF THE AZORES

For years preceding the war European nations had been busily engaged in preparing for new trade opportunities following the opening of the Panama Canal, and the inhabitants of the Azores were likewise deeply interested. The "Junta Geral," or local government of St. Michaels, was active in its efforts to establish large hotels in Ponta Delgada and Furnas and to connect the principal points of the island with an electric railway. With the return of peace, the islands are taking on new life.

The highest and lowest temperatures ever recorded are probably 85 and 45 degrees. With a semitropical climate, famous thermal baths, and a favorable location, it certainly would appear that the inhabitants of St. Michaels are justified in their ambition to make their island the famous summer and winter resort of the Atlantic.

NOTE.—The writer is greatly indebted to Colonel Chaves, the Junta Geral of Ponta Delgada; Miss Sophia Brown, Mr. J. J. da Costa, and others for their assistance in securing data and views for this article.

A MAP OF THE NEW GERMANY

BEFORE plunging the world into a war of aggrandizement, the German Empire in Europe had an area equal to our New England States plus that of New York, Pennsylvania, and Virginia. Today this Germany, which expected to be all-powerful, is shorn of territory equal to all the New England States, Maine excepted, and may lose by the vote of peoples in the affected territories additional areas equivalent to the State of New Jersey. Her name on a far-flung colonial empire of 1,270,000 square miles has been blotted from the map of the world.

Thus do the discord-makers not only fail to inherit the earth, but they have taken from them even that which they had.

The boundaries of the new Germany, as limited by the Peace Treaty of Versailles (accurate in so far as can be determined by the official summary of the document), are shown on page 546.

The areas which Germany surrenders outright to her enemies are: Alsace-Lorraine, 5,600 square miles, to France; two small districts surrounding Malmedy and Eupen, 382 square miles, to Belgium; portions of Silesia, Posen, West Prussia, and East Prussia, 27,686 square miles, to Poland; and the 40-square-mile northeast tip of East Prussia in the vicinity of Memel.

In addition to these areas, Germany loses sovereignty over the internationalized Saar basin, 738 square miles, and the free city of Danzig, 729 square miles.

Those regions that may be lost to the former Teutonic Empire by vote of a majority of the inhabitants embrace 5,785 square miles (an area larger than the State of Connecticut) in East Prussia, which may go to Poland; three strips of territory in Schleswig, aggregating an area larger than Delaware, which may go to Denmark, and 910 square miles of East Prussia above the Niemen River, about whose future the Peace Treaty summary is ambiguous.

Nor do these statistics of area convey the full story of Germany's reparation, for many of these districts of which she is thus deprived are among the richest in mineral resources and in population of all her domains.

THE NEW GERMANY AS LIMITED BY THE PEACE TREATY

The people residing in the areas designated as "Plebiscites" are to determine by vote whether they wish to remain a part of Germany or be incorporated into Poland or Denmark, respectively, according to locality (see text, page 545).

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